MAY/JUNE 1996
No. 39

Backwoods Home magazine

SPECIAL BUILDING EDITION

practical ideas for self-reliant living

11 GREAT BUILDING ARTICLES

- Lessons of a Log Home
- Your Own $78 Garage
- Concrete Dome Home
- Chainsaw Lumber Mill
- Cheap Brick Walkway

- Chutney, Jam & Pickles
- Classic Backwoods Rifle
- How Smart are Computers

$3.95 US · $5.50 CANADA

0 74470 78477 7 06

My view

The age of misinformation

Recently I exhibited this magazine at a three-day Natural Health Show in Pasadena, California. The show, according to its sponsors, was meant to educate people about natural alternative approaches to health and healing, which is not a bad goal. The show, however, was anything but educational. It was largely an exercise in disinformation, with many vendors handing out phony documentation backing up exaggerated health claims for their products. The products ran the gamut from cures for cancer to water that would help the drinker live for 100 years.

In many respects the show was no different than the environmental and New Age shows I've gone to in the past. These shows too are largely platforms for charlatans to expound theories based on nonsense and to sell solutions based on pseudoscience. The most bizarre of the shows are the New Age affairs, where serene-looking people parade around with metal triangles over their heads, claiming to be communing with the cosmos. People at these shows are into exploring their inner and outer selves, their consciousness and unconsciousness. They like to talk in generalizations about how modern man must get beyond modern science and achieve harmony with the energy of the universe. Psychics and modern day holymen abound at these shows.

If you'd like to see a first hand example of what I am talking about, go into almost any bookstore and examine the plethora of books dealing with miracle cures, spirituality, and cosmic consciousness. They are not sold as science fiction, but as factual how-to descriptions of how the world really works. For those of you who understand the value of real science, that is, the science that has given us modern medicine and things like automobiles, airplanes, and computers, a close examination of this fantasy science may make you laugh. There must be a lot of stupid people out there, you might say.

It may be stupid science that these shows and books are full of, but I am meeting an alarming number of not-so-stupid people who seem to believe in some of this stupid science. Just the other day a friend of mine, who dreams of one day travelling to other star systems much like the actors on Star Trek do, started telling me that mankind must rethink science so it can get beyond the limitations of present day science.

I asked him what he thought science was, but he beat around the bush with generalized explanations until I realized he couldn't tell me. When I tried to explain to him that science isn't some theory you reinvent, that it is a method that allows you to discover the way the real world around us works, he protested that I was thinking about science in an old fashioned way, that the only way mankind was going to advance, both physically and spiritually, was by reorienting our thoughts towards a new reality.

This type of mumbo jumbo made no sense to me, and I realized it was the same type of mumbo jumbo spouted at the shows and in the New Age books. The only thing that was different was that it was being uttered by someone who I thought had both feet on the ground.

The popularity of these charlatan shows, the New Age books, and the mumbo jumbo explanations they put forth to explain their version of reality are, I think, part of a sad epidemic that is gripping much of modern society—a reliance on information that has nothing to do with reality. It is as if the clock is turning backwards to more ignorant times when superstition ruled the world. The shows and the books, in a very real sense, are a rehash of the ancient religions and cults that once drained off much of mankind's mental resources while doing nothing to improve the lot of people.

I think it is important for all of us to keep in mind that science is not some religion that has become popular during the last 300 or so years, ever since Englishman Robert Boyle and others began using the scientific method to discover how the physical world works. Science is not something you reinvent to suit your view of the world; it is simply a method of discovering how the physical world works.

Science is based on the scientific method, which demands that theories be subjected to verifiable experiments. The scientific method can be practiced by Christians, Buddhists, Hindus, Muslims, Jews, atheists, and agnostics. A Buddhist in New Delhi performing the same experiment in organic chemistry as a Christian in New York will get the same result. It's not a matter of opinion; it's a matter of verifiable fact.

It is this scientific method that has made possible all the modern technological inventions and discoveries of mankind, from vaccines for disease to increased ways to pull food from the soil to virtually every convenience in your house that turns on with the flick of a switch. The discoverers and inventors of these wonderful things run from Louis Pasteur to Jonas Salk, and they all used the scientific method. Name me one new age mystic who has done anything other than line his own pockets with other people's money?

This modern day reliance by so many people on this new conglomeration of fantasy sciences is disturbing because it represents a giant leap backward for society. The scientific method is the greatest invention since fire, and we can't turn our back on it now. There are more problems to be solved and they are not going to be solved by some New Age prophet pretending to commune with the cosmos.

This issue of *BHM*, which contains many how-to articles about building your own home, contains more real science than all the New Age books put together. Δ

Make your own lumber with a chainsaw mill

By Jacqueline Tresl
Diagrams by Mark & Jacqueline Tresl

Milling a board with a chainsaw lumber-maker

These are trying times for those of us who need to buy lumber. The prices of good boards are at an all-time high. The E.P.A. is shutting down the mills that make plywood. The timber companies have less old growth forest to choose from. Most of the affordable timber is being cut from new-growth pine. In the Midwest, the standard 2x4 is made primarily from spruce. Boards made from cherry, oak, or poplar are expensive. The easy solution to this lumber crisis is for the woodworker to make his own boards from the trees of his choosing.

There are many methods for making boards from trees. Most of them require costly equipment or contracting out the work. The portable sawmills that will make boards in the back yard cost several thousand dollars. If the back-yard woodsman chooses to cut down his own trees and send them off to the mill, transporting the trees to the mill and bringing the finished boards back home is expensive.

The affordable and practical solution for the carpenter who needs lumber is to make his own boards at home with his chainsaw. With a large saw and a special device fitted onto the chainsaw bar, any kind of board can be made for just pennies. This device, known as a chainsaw lumber-maker, will mill through any tree, no matter how large or tough, making boards of any length or thickness.

The construction of a chainsaw lumber-maker requires a bit of steel and pipe and a few bolts (Figure 1). To make the mill, a rectangular frame, slightly shorter than the length of the chainsaw bar, is welded together from square and channel steel stock.

Once the frame is welded, two recesses need to be ground into the centers of the channel stock pieces which make up the two short sides of the rectangle (Figure 2). In these recesses, two pieces of half-round pipe are welded into the channel stock. These half-round pieces will act as sleeves to accept the two pieces of whole round pipe. The round pipe will be adjusted up and down according to how thick the miller wants his board.

Next, two short pieces of square tubular stock are welded onto the ends of the whole round pipes. These short pieces should be four inches longer than the width of the chainsaw bar. To make the square stock stronger, reinforce it by welding a 3/8" steel plate onto the center of the underside of the short square tubular stock. Then, from the center line, measure an equal distance out from both sides and drill holes using a 5/16" drill bit to provide for a 3/8" tap and bolt size. Drill through the plates and the one side of

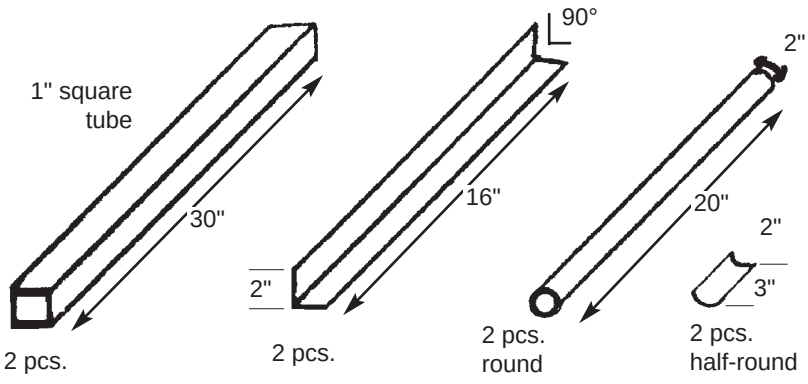


Figure 1: The pieces

the square stock as shown in Figure 3. These pretapped steel plates will act as the bolting surface for the chainsaw's bar.

In order to bolt the welded frame onto the bar, remove the chainsaw's body from the bar. Drill four holes, two on each end of the bar, centered to match the pretapped holes on the reinforced square tubular stock. Bolt the mill onto the chainsaw bar through these reinforced holes by using four 3/8" machine bolts. Then lower the rectangular frame onto the round pipe which is welded onto the short square tubular stock which is now bolted onto the bar. With the mill bolted onto the bar (Figure 4), the bar is put back onto the chainsaw body.

The rectangular frame can now be adjusted up and down to set the thickness of the milled board. To make these adjustments, two muffler clamps, one above the other, are placed around the half round and the whole round pipe (Figure 5). To set the correct measurement for the sleeves, measure from the chainsaw bar to the part of the rectangular frame that rides against the log (Figure 4). By loosening the clamps, the round pipe can be moved up or down to adjust the board thickness. Once tightened, the clamps will keep the pipe from moving up and down while milling. This enables the miller to make boards of uniform thickness.

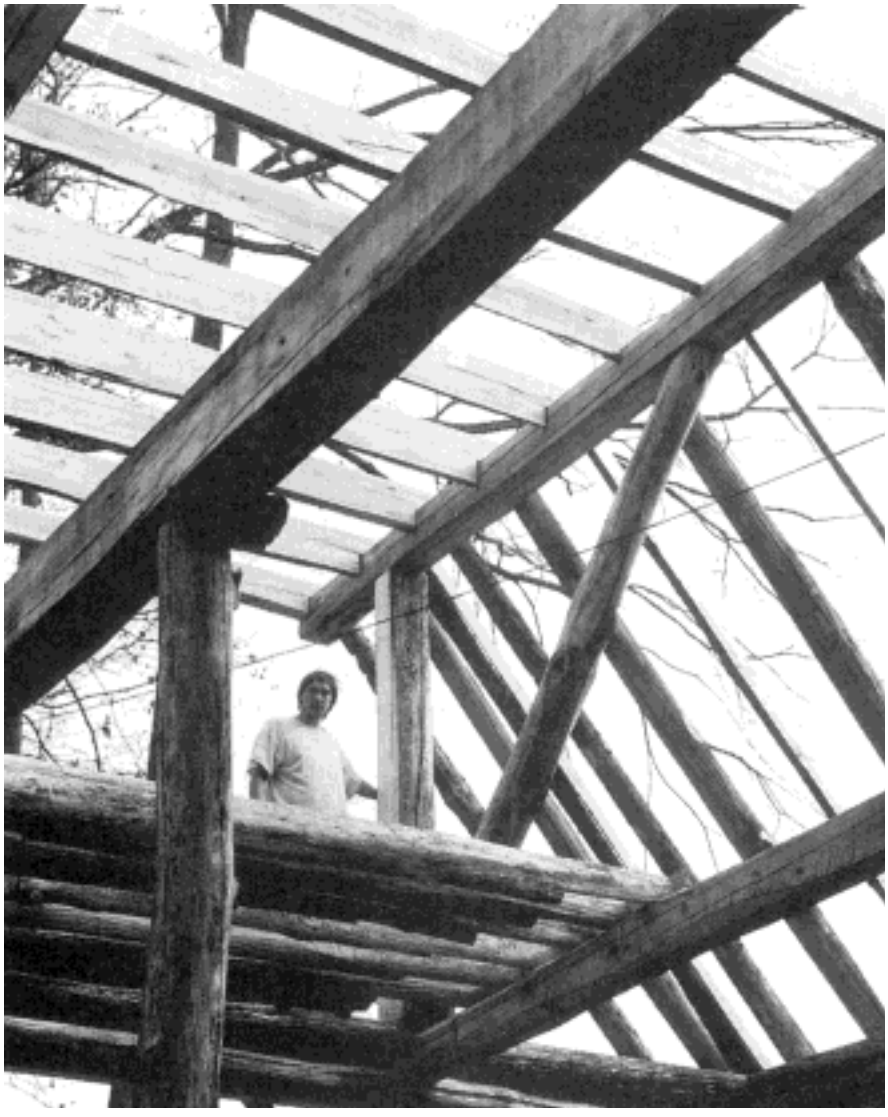
Note: Not all chainsaws are suitable for a mill attachment. The chainsaw engine must be at least five cubic inches. The style of the saw must be such that it can be refueled in the milling position, with the bar parallel to the ground. The saw must have a 30" bar or longer. The longer the bar, the wider the boards that can be milled. A 36" bar will mill boards 24" wide. The chain must be chisel style and be ground square with a hook angle of 40 to 50 degrees.

Before lumber-making can begin, one side of the tree to be milled will need to be made flat. This initial cut is different from all subsequent cuts, because the mill must first have a flat surface to rest on. This beginning cut is made with a *starter board.*

A starter board is a board at least ten feet long with steel sides running the length of both sides of the board (Figure 6). The length of the starter board determines the length of the boards that can be milled. A ten-foot starter board is the best length for most situations. The board is two inches thick, and the channel iron running the length of it will act as a guide for the mill to be pushed along. Once the initial cut is made, the top surface of the log will be flat, and the starter board won't be needed again until a new log is started.

A starter board will last for years. If three or four ten-foot starter boards are made, they can be set end to end and a 30- or 40-foot tree can be milled, providing lumber long enough to make beams. With the chainsaw lumber-maker, any length board is possible, as long as that same length of starter board (or boards) is available.

To mill lumber, the chainsaw is started and then laid horizontally either against the starter board or the flat surface of the log. The bar is guided carefully into the log's end as the



Beams, joists and walls were made with a chainsaw mill.

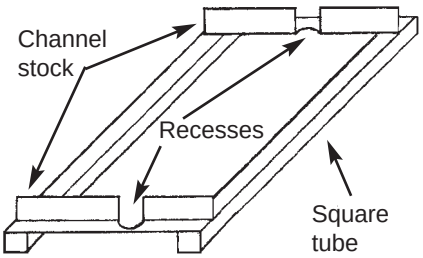


Figure 2: The frame

cut begins. The saw will be easier to guide through the log if the tree slopes slightly downhill away from the miller. The mill only needs to be steadied and pushed gently until it reaches the end of the cut. At the log's end, the throttle is released and the chain eased out.

When milling softwoods, board production is fast. Twenty pine or poplar boards can be milled before lunchtime. With dense trees like locust or elm, milling goes a bit slower, and the chain will need to be resharpened more often. Yellow poplar is a great choice for backyard lumber-making, as it is a soft hardwood, and its variegated colors make it a superior choice for woodworking projects. Since poplar grows quick, tall, and straight, it has enough strength to carry stress loads, yet mills easily.

Boards milled with a chainsaw lumber-maker are smooth and do not need to be planed. Freshly-milled boards are stacked 20 tall with a one-inch air gap between boards. For the highest quality lumber, the boards should be kept under cover and away from excessive moisture. Lumber made from dead trees can be used in two weeks. Green wood needs to cure at least three months. If the boards are intended for flooring, they can easily be tongue-and-grooved by using a dado cutting blade on the table saw.

The lumber-maker frame itself requires no maintenance. The saw chain needs to be kept sharp, and it will be over seven feet long, so chain sharpening is the most tedious part of lumber-making. The chain will need to be sharpened after every eight hours of milling, and a new chain bought after every 5,000 board feet milled. If the trees to be milled are dragged home in the dirt, the chain will get dull much faster.

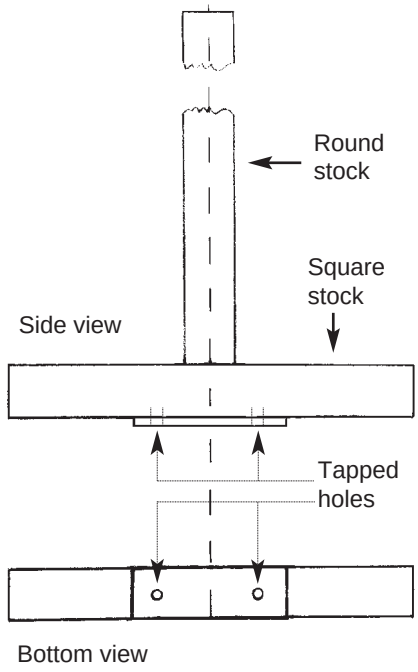


Fig. 3: The surface to which the chainsaw bar is bolted

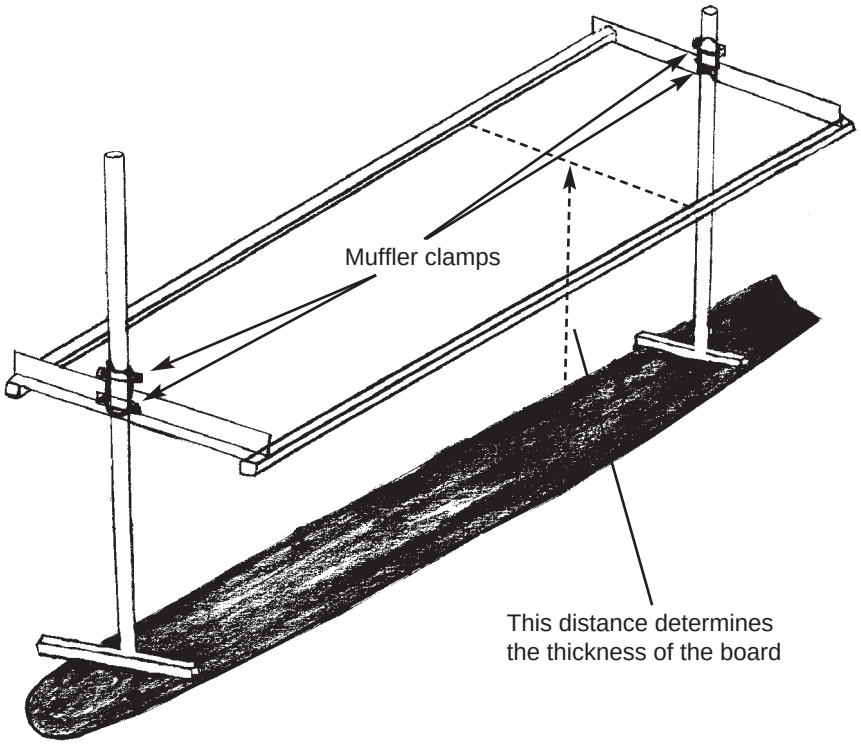


Figure 4: The assembled mill frame is bolted to the chainsaw bar.

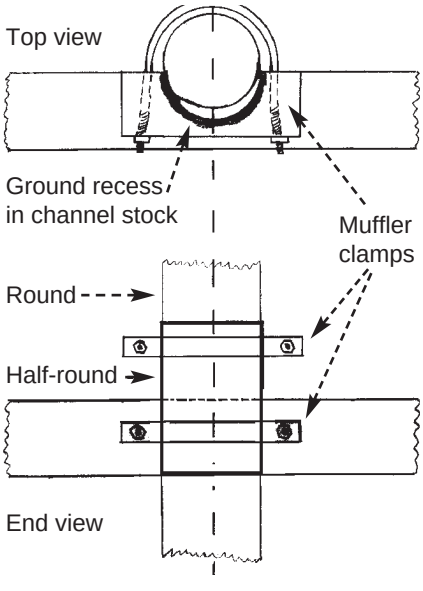


Fig. 5: Muffler clamps hold settings to determine thickness of boards.

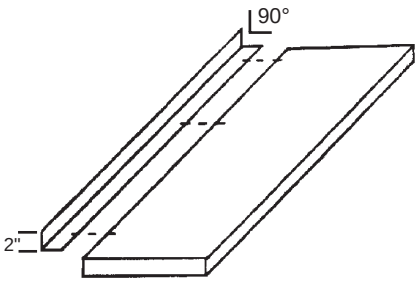


Figure 6:
The metal-edged starter board makes the first cut flat and straight.

The mill is potentially quite dangerous. Good safety measures during its operation are important. Besides the need for safety glasses and ear protection, the miller must never become distracted or take his attention from the mill. Seven feet of rapidly moving saw chain can be lethal.

Once the woodworker owns a chainsaw lumber-maker, he will never need to buy lumber again. Houses can be built from the substructure to the roof just from the trees in the back woodlot. If 12-inch-wide roof beams or 4x4 posts for footings are needed, the lumber-maker can mill two or four sides off of a tree by moving the starter board. Logs can be milled flat on two sides to make tight-fitting walls for a log house, leaving less space to be filled in with chinking.

Starterboard, chain, and mill

Milling boards from the back yard is great for the environment: it recycles unwanted or dead trees, and trees can be cut out selectively, allowing smaller trees to fill in the open areas without clear-cutting an entire forest. Trees that might have been left to rot can be milled into beautiful lumber.

With the chainsaw lumber-maker, the carpenter has unlimited choices of species and size of boards for his projects. The days of picking through crooked, inferior boards at the lumberyard will be over. And no more sticker shock at the cash register over a pile of 2x4s. Backyard lumber-making will save the woodworker hundreds of dollars and allow his creativity to soar. Δ

Guiding the lumber-maker through a cut

I've often wished that I had clear,
For life, six hundred pounds a year;
A handsome house to lodge a friend,
A river at my garden's end,
A terrace walk, and half a rood
Of land set out to plant a wood.

—Alexander Pope
1688-1744

A BHM Writer's Profile: Carole Perlick

Carole Perlick has had a varied work career. She worked as a nurse for 20 years as well as running a grocery-liquor store for her husband. Carole also managed a 72-unit apartment building in southern California. Since retiring with her husband of 40 years, Carole has enjoyed a new hobby of writing for BHM and currently has a weekly column with a local newspaper. She and her husband live on Copco Lake in California.

Here's a "helping hand" for your chainsaw lumber mill

By R.E. Bumpus

Anyone who has ever operated a chainsaw lumber mill will agree that, while they *do* produce lumber, the amount of physical exertion required can give you second thoughts about the high price of "store bought" boards. This simple, inexpensive, and mobile accessory can make the difference between actually using your mill and leaving it on a hook in the tool room.

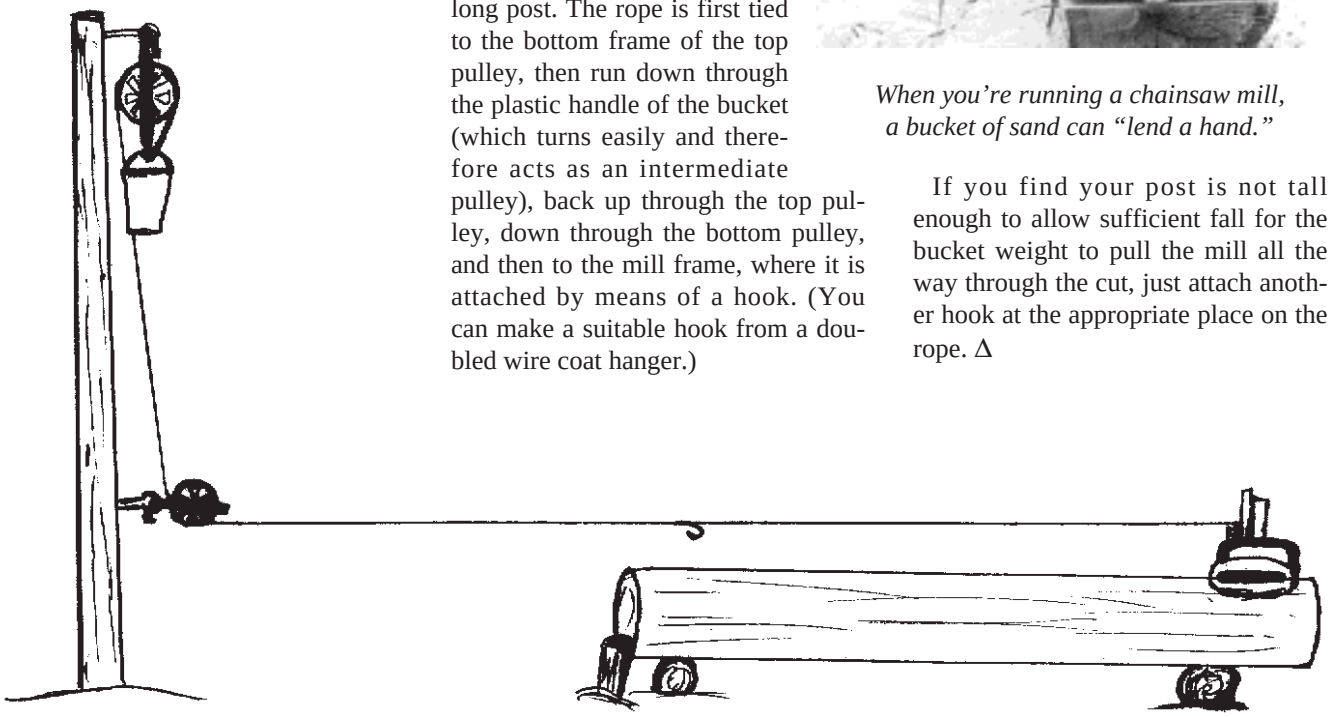
All that's required is two lightweight pulleys, one long post and one short post, a five-gallon plastic bucket, and a length of 1/4" rope. The rope is strung through the pulleys and the handle of a weighted bucket and attached to the mill frame. The weight of the sand-filled bucket exerts pull on the mill and allows you to operate as if you had a helper on the stinger end of the chainsaw (see diagram).

The weight of the sand in the bucket is adjusted to accommodate the variables you'll find in sawing lumber. The type of wood, the diameter of the log, the capabilities of your chainsaw, and the type of cutting chain on the saw all affect speed and ease of producing lumber. Generally speaking, the larger the saw, the more lumber you can produce.

The long post is planted 10 or 12 feet from the end of your saw log. The short post is planted against the end of the log to stabilize the operation. The pulleys are attached to the top and near the bottom of the long post. The rope is first tied to the bottom frame of the top pulley, then run down through the plastic handle of the bucket (which turns easily and therefore acts as an intermediate pulley), back up through the top pulley, down through the bottom pulley, and then to the mill frame, where it is attached by means of a hook. (You can make a suitable hook from a doubled wire coat hanger.)

When you're running a chainsaw mill, a bucket of sand can "lend a hand."

If you find your post is not tall enough to allow sufficient fall for the bucket weight to pull the mill all the way through the cut, just attach another hook at the appropriate place on the rope. Δ



You have to look beyond the building code to create really pleasing stairs

By Skip Thomsen

This article isn't about how to build stairs, or even about the technicalities of designing stairs. There are lots of books available that already do an admirable job in these areas. (See end of this article.)

What we are going to discuss is the *aesthetics* of stairs, and the value of stairs that goes way beyond their function of providing a means to get from one floor to another. This is the information that's left out of all the technical books, and it is exactly this information that makes the difference between a technically-correct, code-legal staircase and one that is a work of art and a pleasure to use.

An interior staircase can be the focal point of a room. An exterior stair can light up the face of a whole building.

Photo 1

More often than not, stairs appear to have been designed merely to take up the least amount of space possible or to get them out of sight or out of the way. Many times they appear to have been designed as an afterthought: "Now that we've got a second floor, where are we going to put the stairs?"

A staircase can be so visually inviting that it beckons one to try it out, to see where it leads. Stairs can be interesting and comfortable to walk. A staircase can even be designed to have a landing that affords a unique view of a room or out of a special window. But too often, staircases are basically boring, many are uncomfortable and/or tiring to walk, and some are downright dangerous. Many staircases are even intimidating, by being too steep or dark or narrow.

So what are the ingredients of the perfect staircase? The basic ingredients are safety, comfort, eye-appeal, and visual and functional integration into the design of the room or building. All of these elements are amazingly simple to put into practice.

There are just a few fundamental rules that, when adhered to, will produce a safe, easy-to-walk, comfortable staircase. The visual aspect is admittedly a little more subjective, but there are some basic guidelines that apply here, as well.

Getting started

In new construction, it's fairly easy to design a staircase that meets all these requirements. The real challenge is coming up with a good design when a second floor is added to an existing building, or an additional staircase is planned for an existing upper floor.

Although I promised that this would be a non-technical article, I'm afraid that we have to start with one technical rule as the basis on which to build all staircases. The most fundamental rule of designing any staircase is the "Rule of 25." It goes like this: any staircase will be safe and easily walkable if the height of two risers plus the width of one tread equals 25 inches. Sounds too easy, doesn't it? But it really works.

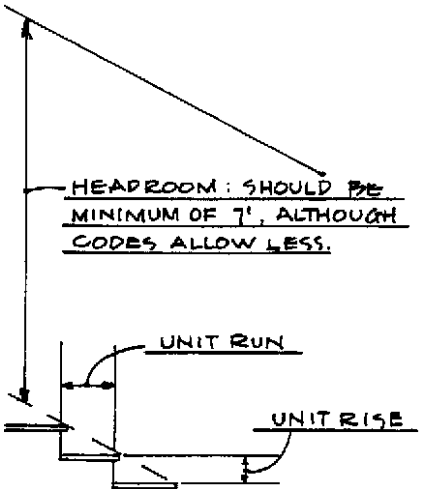


Figure 1

First, let's make sure we are all talking the same language here. *Rise* and *run* are stair-speak terms. *Unit rise* is the height from the floor to the top of the first tread, and/or the height from the top of any one tread to the top of the next one. *Unit run* is the width of each tread, or the distance from the face of one riser to the face of the next one. *Total rise* is the height from the floor-surface to the next floor-surface serviced by the staircase. *Total run* is the length of the staircase, or the combined lengths of all the treads. (See Figure 1.)

The minimum unit rise for a normal staircase is usually 4", and the maximum, except for service stairs (that aren't used often) is 7". Service stairs can go as high as 8", but that is considered a steep staircase. The most comfortable range for the average

Photo 2

staircase and the average person is between 6 and 7 inches.

Techno-stuff

For a staircase to be comfortable to walk at a natural pace, the wider the tread gets, the lower the riser must be. Conversely, the higher the riser, the narrower the tread. For example, to determine the best width for the treads of a staircase that will have a 7" unit rise, use the Rule of 25: 7+7=14, then 25-14=11. A staircase with a 7" unit rise will need an 11" unit run (or 11" wide treads) to be comfortable and safe to walk by the average person.

Another example: Let's say you would like to maintain 12" treads (unit run) on your entry stairs. Let's do the math: 25-12=13, and 13 divided by 2 equals 6 1/2. The unit rise, or the height of each step, will then be 6 1/2".

This amazing rule is not just somebody's opinion or an "old wive's tale," either. Try walking various staircases and taking note of ones that are comfortable and just seem to naturally fit your feet and gait. Then measure the rise and run. Now try measuring some that seem awkward. You will find that the Rule of 25 applies every time.

Another detail, and this is one that's covered in every building code (for good reason), is that *each unit rise must be the same*. Different building departments will specify different limits here, but they usually specify 1/4" or 3/8" maximum variation. Personally, I keep mine within 1/8". It's surprising that such a little variation in step-height can make such a difference in walkability, but it really does. When you go up or down stairs, you automatically adjust your gait for the height of the steps. If you get to one that isn't the same as the rest, you will almost surely trip. Going up, you'll catch a toe on a high step or lose your rhythm on a low one. Going down uneven staircases has caused many people serious falls.

OK, that takes care of the technical stuff. From here we go beyond the technical and venture into the aesthetic and psychological aspects of stair design.

The planning stage

In the design phase of a new building, consider the staircase as an architectural feature of the building. Properly done, an attractive staircase can transform an otherwise ordinary-looking building into a showplace. Exterior, or entry stairs should be inviting. From the first moment they come into view to one who is approaching the building, the stairs should welcome the visitor. From a design point of view, this means that the stairs should not only be gradual and easy to climb, but they must present a gracious invitation.

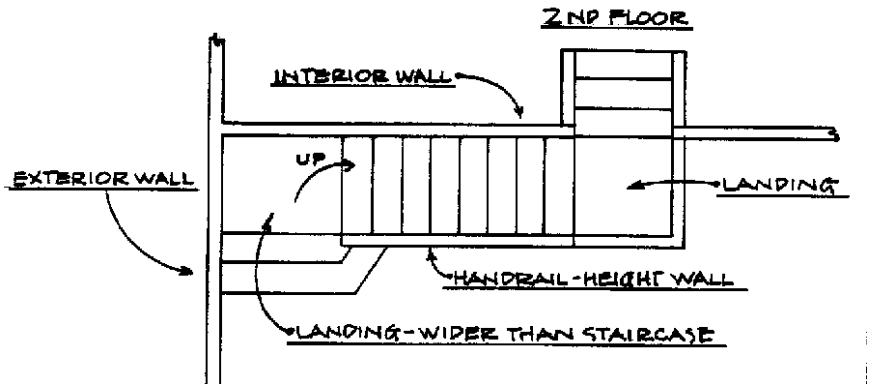


Figure 2

Photo 3

The easiest way to offer graciousness in most areas of construction design is to make the particular element a little more generous than is absolutely necessary. Sounds simple, but it works. If an entry stair needs to be four feet wide to satisfy code requirements, make it six feet wide. Or wider. Another little detail that almost always enhances any staircase is to make the bottom step or two a little wider than the following ones.

Photo 2 illustrates both these points. First, this staircase, which could have been three or four feet wide and still satisfy legal and safety requirements,

is in fact a little over six feet wide. Look at the picture and imagine it being only three or four feet wide. See the difference? It would have presented an even more inviting face at eight feet wide. Notice that the bottom wooden step wraps around the posts, and the concrete step is a bit wider than the wooden one. The staircase seems to "flow" out onto the ground like the open arms of a waiting and welcome embrace. Adding a feeling of graciousness to a staircase by making the first few steps wider than the following ones works well in most cases, but care must be taken here to avoid making a staircase appear to be "narrowing," which is distinctly intimidating. The object is to open up the first few steps of an already inviting staircase.

Photo 4

Interior stairs

The same principles of widening the base of a staircase apply to interior stairs. There are several ways this can be accomplished. One of the most effective, especially if the staircase runs down alongside a wall, is to have it turn ninety degrees into the room by way of a landing that is a foot or two wider than the staircase itself. Then the first one or two steps up to that landing are the full width of (or wider than) the landing. (See Figure 2 .)

The ninety-degree turn at the bottom of a staircase that runs parallel to a wall has another benefit, too. A staircase is always more inviting if it opens into the space from which its traffic arrives. In other words, the bottom stairs should face into the room serviced by the staircase.

Go that extra mile

Often, designers and builders will keep everything in a building to code minimums to cut down costs. (Guess why tract houses all look the same.) The small extra cost of making a staircase a little wider than required by the building code is soon forgotten, but the convenience, feel, and ambiance it provides is permanent. It's best to avoid narrow stairs in any place where they will be used often. Consider the probable uses of a staircase. Will furniture have to be carried up and down? Appliances? Will there be a likelihood of opposing traffic?

The same thing applies to steep staircases. Most staircases are steeper than they need to be, and most are that way just because the designer either didn't want to put in the extra effort required to make a more comfortable staircase fit in the same space, or the builder wanted to "keep things simple and cheap." Often, it does take some extra time and effort to plan the perfect staircase. And it almost always involves a little extra labor and cost to build it. But in my experience of designing and building (and selling) custom homes, it has always been worthwhile. I believe that my staircases have been instrumental in selling my homes. It's not that a buyer exclaims, "Wow! That staircase! I've got to have this place!" What happens is that people are drawn to the overall feel of the place, and even though they don't realize it, the stairs have a lot to do with it.

The width-to-length ratio is one of the most important details to take into consideration when designing any stairs. A long, narrow staircase looks intimidating in most circumstances. If a lot of stairs are needed because of a big elevation change, break up the staircase with landings. Keep each run of stairs fairly short, with about eight steps being a maximum if at all possible.

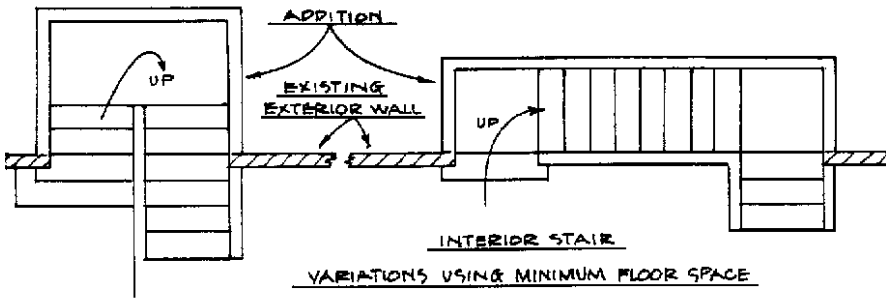


Figure 3

Different styles

Stairs can be open, enclosed, all-wood, carpeted, or combinations of these. An example of a combination approach is pictured in Photo 3. The bottom of this staircase is a three-step-up landing (not shown). From there, the open, wooden run goes to a second landing, from where the remainder of the steps are enclosed and carpeted to match the second floor. The staircase affords several interesting views of the room below (Photo 4).

A lot of the visual interest in this particular staircase comes from the materials and assembly techniques used in the open stairs (Photo 1). The wood is nearly knot-free fir with the exception of the end-caps on the treads, which are dark cedar. The staircase was finished with several coats of high-quality spar varnish. A staircase like this is admittedly very labor-intensive, and a much simpler way would have been to enclose and carpet it all the way. But this staircase was designed not only to be a focal point of the room, but its openness visually subtracted less space from the room.

An example of a fully-enclosed, carpeted stairway, and the visual interest it supplies to a small building, is shown in Photo 5. This relatively small (1400 sq. ft.) home has expansive views like this throughout, giving the feeling of a much larger, more open space. Stairways are the perfect medium to make these views possible.

There are three landings in this staircase, so the whole unit takes up very little floor space, yet the riser heights are a comfortable 6½". Every cubic foot of space under the staircase has been utilized, too.

Notice the stair lights in some of these staircases. They are inexpensive, and make it possible to illuminate the stairs with very low-wattage lamps. A light is placed near the edge of each landing and in the middle of each run longer than three or four steps.

In some cases, an interior staircase can be constructed outside of the actual building. This technique works in new construction, but is especially well-suited to an upstairs add-on, as no existing floor space is taken up by the staircase. (See Figure 3.) The supporting structure for the staircase can be cantilevered from beneath the building, or it can be hung from the existing wall structure.

An interesting point to keep in mind for second-floor spaces like apartments or offices is that an exterior access to these spaces is not only a convenience, but it gives whoever lives in or uses that space a feeling of autonomy and independence. Having to go through someone else's space to get to your own is often uncomfortable. It's much more pleasant to have your own entry.

Photo 5

Handrails

Another essential ingredient of any staircase is the handrail. The dimensional limits of handrails are spelled out in the technical stair-design books, and are also strictly enforced by the building codes . . . but again, there are other considerations that go beyond the code requirements. These include not only aesthetics, but thoughtful little details that can make the handrail more than just something to hold onto.

Handrails should be designed to complement the staircase itself and any adjacent trim. When designing a handrail, picture yourself holding onto it and sliding your hand along its entire length. The no-splinters part is obvious, but not so obvious is the ability to run your hand along the railing without hitting the mounting hardware or brackets, encountering tight spots not quite big enough to pass a large hand comfortably and safely, and having the railings start and end so that they fall to hand naturally.

Another very important and often overlooked aspect of designing and building handrails is that they need to be rigid and well braced. A handrail, especially one that is more than a few feet from the ground, can feel very scary if it moves even slightly when leaned upon. Properly done, a railing or handrail shouldn't yield at all under anything that could be considered normal pressure. And for sure it better not fail if someone falls against it (like they always do in the movies).

A very short bibliography

Rob Thallon's Graphic Guide to Frame Construction has a terrific section on the technical-design aspects of every kind of stairs imaginable. (The Taunton Press, ISBN: 1-56158-040-6) I've been building houses for more years than I can remember, and this book is still my most valuable reference. You can build a frame house from the ground up with just this book as your guide. The text is clear, it is supported by excellent illustrations throughout, and the index is super.

(Skip Thomsen describes himself as a "sort-of-retired designer and builder of one-of-a-kind homes that are individually crafted to be at ease with their immediate environment." All photos, drawings and stairs are by the author.) Δ

Here's a mighty creative way to protect your plants from animals

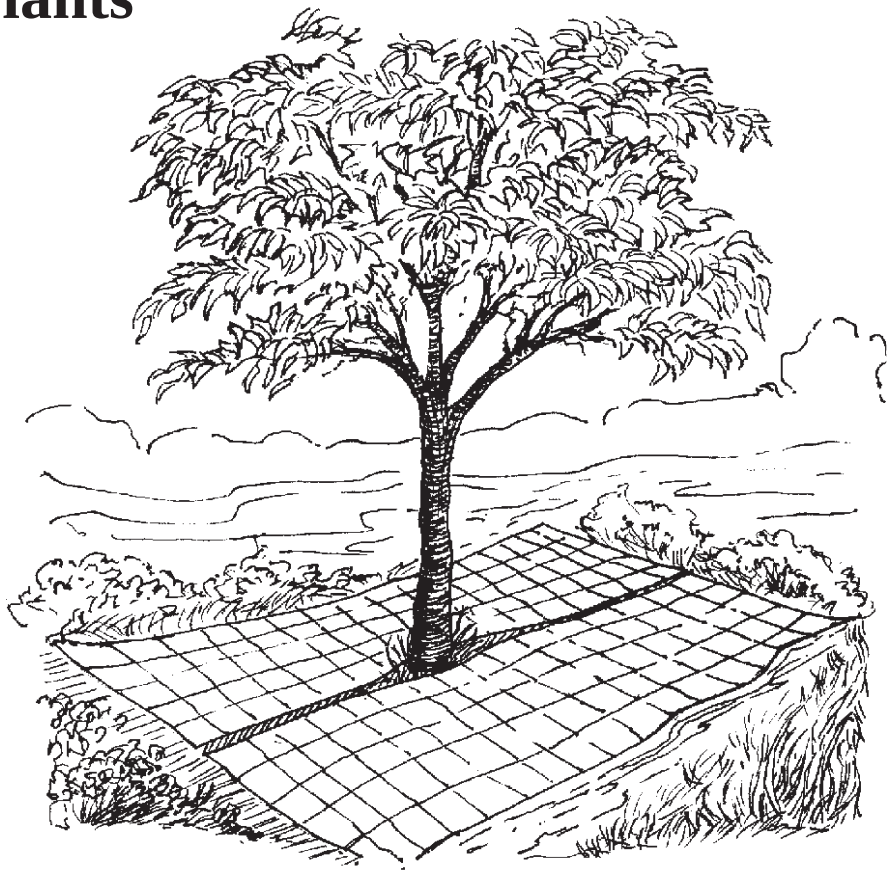
By Joy Lamb

A huge brown beast stared at me as I drove through our apple orchard toward the house. I parked, walked quickly into the house, and said to my husband, "Tom's bull is munching on our apple trees."

He shot past me out the door, yelling, "Call Tom and tell him to get over here now!"

The next half hour was spent running this way and that. We chased south and withdrew to the north. We herded south and blocked on the east and west. Finally the bull, several cows, and one fat sheep were escorted out of our orchard and into their own pasture. During this process, the bull nonchalantly stepped over a three-foot fence and trampled my garden. Later, while discussing the event with Tom, we decided that we were glad that most of our vegetables, flowers, and shrubbery had been spared. The apple trees were left standing with only minor damage to the foliage and fruit.

This incident was only one of many animal-related problems we had faced since we had become backwoods homeowners. Deer stripped new growth off young fruit trees, cats used vegetable plots for litter boxes, and visiting dogs dashed through flower and vegetable gardens, trampling as they went. Even our own dog loved to dig in planted areas rather than the natural wooded areas. We were frustrated. My husband built fences higher and higher around the orchards. This was useless, as deer can jump amazingly high. I planted shrubs, flowers, and vegetables, only to have them torn up by dogs. The cats loved the freshly worked soil, and rabbits nibbled at what was left. And this was not the first time we had been invaded by bovine beasts. What were we to do?



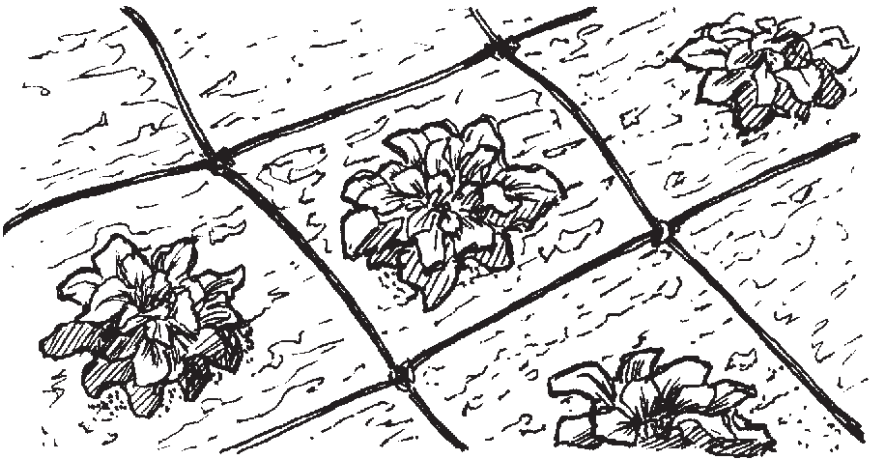
Fencing is laid in two sections around a fruit tree. The tree can be watered, fertilized, sprayed, and harvested with the wire in place.

At first we tried fences. We fenced groups of trees, we fenced islands of flower gardens around the house, and we fenced vegetable plots. We created a botanical zoo with plant cages all over our property. The fences kept the dogs out but did not faze the cats, cows, and rabbits that wandered through. The deer were not even slowed down by the fences, no matter how high we made them. The fences were unsightly and very inconvenient when we were caring for the plants and trees. We became vigilant plant guards, but decided we did not want to dedicate our lives to this pursuit, especially our lives between 10 p.m. and 6 a.m.

We thought through the problem and came up with a solution. We immediately put into action our "Protect Trees and Plants from Four-Legs Plan," and very soon we knew we had a plan that worked.

We had used livestock fencing attached to wood and metal stakes for fences. We removed the stakes, cut the wire fencing into workable sizes, and just *laid it on the ground* in the areas we wanted to protect. Once an animal puts a foot on the wire, it backs up. We were and still are amazed at how well this works.

Our dog will not enter the areas covered with wire, so no more uprooted



Sections of fencing can be laid right over small plants.

and trampled plants. No more holes dug under trees. The cats find better areas to scratch, and best of all, the deer keep away from our trees. It is so nice not to have all the new growth eaten off the trees. We have not had a visit from a bull, cow, or sheep since we laid the wire, but we think it will work for them, too. We have found bear spoor in the areas furthest from the house, but our trees and their fruit have remained undamaged. I still see rabbits in the clover surrounding the apple trees and in the native undergrowth, but there have been no holes dug around the wire-protected trees. We have not detected any damage to the fruit trees or the gardens caused by rabbits.

Since we heartily recommend our method to anyone wanting to protect their plant life from four-legged animals without using harsh methods, the rest of this article will provide specific information about it.

Use livestock fencing

A 12- or 14-gauge field fencing works well. It is sturdy and holds up well. It can be cut readily with a wire cutter and is rigid but bendable. There are many kinds, heights, lengths, and hole sizes available. The twisted wire is cheaper and easier to work with than welded wire. My personal favorite is a three-foot-high, 12½ gauge, non-climb fencing that has 2" x 4" holes.

Wire fencing can be purchased at feed stores, hardware stores, and garden shops. The price depends upon the gauge, whether it is twisted or welded wire, the size, and the amount. A 330' roll of twisted wire field fencing with 2" x 6" holes at the bottom and 6" x 6" holes at the top sells, in my area, for $104. A 100' x 3' non-climb 12½ gauge fencing that has 2" x 4" holes sells for $85. I saw 50' x 3' of 14-gauge welded wire fencing for $23.

Save and reuse previously used wire fencing. There are no definite size requirements for the fencing. We often use whatever is on the scrap pile.

Cut into workable sizes

Get out the wire cutters, pliers, tape measure, and work gloves. Besides the fencing itself, that is all you will need to implement the method. “Workable size” means something that you can handle. This obviously varies from person to person and depends on the size of the area and the plant that is to be protected. You need to remember that you will have to be able to remove the fencing to work the soil. Don’t worry about the size of the pieces if you are using scrap fencing. Just do the best you can with what you have. The wire can be overlapped lying on the ground or joined with a twist of the pliers if need be.

For garden areas:

Roughly measure the area. If the fencing can be cut in one piece, great. If not, cut the fencing into the largest sections possible that will cover the area. However, the pieces should not be so large that you cannot handle them comfortably. Arranging the fencing is discussed below.

For trees and shrubs:

Cut two pieces of fencing, each about 6' x 3'. It is better to use two pieces rather than one, because it is easier to remove. However, we have sometimes placed one smaller piece of fencing over a newly-planted bare root tree. The wire can always be cut later.

Placing fencing over bare or just-seeded soil is easy. Just lay it down and bend over the ends, poking them into the soil

Care needs to be taken so as not to damage plants when placing the fencing over trees, shrubs, or growing vegetables and flowers. Some cutting will be required to make the fencing fit over or around them. At any cut, poke the wire ends into the ground to secure it and to make it safer for you. Overlap fencing as needed for coverage.

Most watering, fertilizing, spraying, and weed control can be done with the wire in place. After all, people wearing shoes can walk on the wire.

When major work needs to be done, such as harvesting, tilling, or planting, simply lift the wire fencing from the ground and replace it when you are finished working. If you originally cut the wire into sizes that you can handle, removing and then replacing it is very easy to do.

We have been pleased with the results of this method at our house. We hope you will be, too. Δ

Your family can afford a computer: buy it used

By Sharon Griggs

You don't have a new car, you shop at rummage sales, and you gladly accept hand-me-down clothes for your kids. So why are you considering buying a brand new $2000 computer system? Don't let some salesman who has charged his credit cards up to the limit and needs the sales commission tell you that you need the newest, most impressive machine with all the bells and whistles.

There are people out there who are upgrading their systems and who will sell their old computers cheap. Often they are sold with software and accessories such as printers that don't come with a new computer. These are things that you would end up having to go out and buy extra and install, if you bought a new computer.

You say you are homeschooling your youngsters and you want them to be computer literate. Or you are running your own home-based business, and you want a computer for that. Or you want to get on the "information superhighway."

Well, believe it or not, you can probably do all these things for under $500, and maybe less if you are willing to shop around. In fact, I bought an old Texas Instruments computer at a garage sale for $10 that is perfect for learning basic programming on. Sure, I had to hook it up to an old TV (it didn't have a monitor), but it came with all kinds of illustrated books about basic programming. I even learned how to program graphics as well as words. You won't get that kind of information with your new gee-whiz right-out-of-the-box computer. And you won't be afraid to try things on a cheap old machine, daring things that you would be afraid to risk on an expensive new computer.

But you say you want a little newer technology. You want to be able to hook up a modem and explore the on-line world about your areas of interest. Here's where you really get lucky. Newer, faster modems are being put on the market all the time and people just gotta have 'em. Slower modems are getting cheaper, and faster ones are quickly being discarded and replaced with even faster ones. And there are "trial-run" offers all the time from on-line services that let you get on-line for 10 hours free. Why not try them all? A used 386 IBM-compatible computer or a used Mac should be plenty good enough to get you there. Like driving a good used car, you go a little slower, but you get there just the same.

Heard about Windows 95? Well, there are older versions of Windows out there, and lots of older computers have the older versions of Windows on them. When you buy one of them, you can upgrade, or you can use the old version while they work the "bugs" out of the new version.

There is also a world of free and cheap software available (such as *shareware*). Just be sure the software is "registered," or legal. In fact, some of the folks who started computing by using some of the older, cheaper programs are so attached to them that they wouldn't give up their old favorites for all the new ones in the world. You may find that you feel the same way about some of these "oldies but goodies."

Really broke? Believe it or not, you don't even have to buy a computer to compute. You can try one out at some public libraries or community colleges for free. One library near us has a computer that is hooked up to the Internet, and anyone can use it. There are also computers there that can be used for word processing (typing) or for bookkeeping for your business. Just buy a floppy disk and bring it with you. Usually someone will be glad to help you get started and get into the tutorial programs on the computer that teach you how to compute step by step, with demonstrations. There are also free classes at the library on how to get on and use the Internet. They attract a lot of "non-techies." In fact, my youngest son (who likes to work on the innards of computers and such but who normally hates to sit down at a keyboard) really likes exchanging points of view on-line with people in other countries.

Don't let a lack of funds slow you down. You too can start computing "on the cheap" and enjoying it as much as we do. Δ

Would you believe . . . a canvas roof? It's simple, quick, durable, and cheap

By Rev. J.D. Hooker

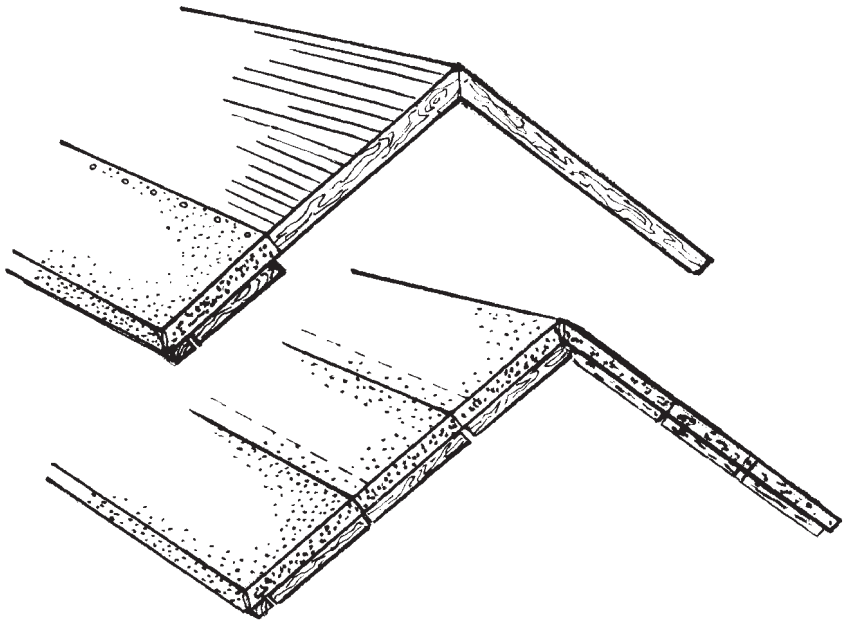
Have you ever wondered whatever happened to all of those big canvas covers from all the Conestoga wagons that crossed the Plains? Well, sure, most were temporarily utilized as tents, until some more permanent dwelling was erected. But eventually, the vast majority of those wagon covers ended up being used as the roofing material on some permanent structure. Often they were used on the central portion of the house (they weren't really big enough for an entire house roof), or atop a stable or other outbuilding

Actually, when properly installed, this sort of roofing is just as watertight, good looking, and long lasting as most of the more expensive roofing materials available at the lumber yard, but it's much quicker and simpler to install.

I think that probably this type of roofing was simply forgotten (like many other good ideas) as newer materials hit the market. As late as the 1950s, some of the "do it yourself" encyclopedias gave instructions for installing canvas roofing. And in many areas where building codes have been around long enough, you'll find canvas roofing covered by the codes. If your area has a long history of building codes, you could just skip reading the rest of this article, and take a look in your county's code book. The information is likely to be practically identical.

Installing a canvas roof

To install a long-lasting canvas roof doesn't require much in the way of equipment. Here's what you'll need:



Stretch and paint one course at a time. Tack only the top edge of each course to the surface of the roof—let the other edges lap over the edges of the roof and nail up with furring strips. Allow subsequent courses to overlap eight inches. When all the courses are in place, apply the second and third coats of paint.

- Enough canvas or other cloth to cover the required area
- Some tacks or staples
- Maybe some furring strips and nails
- Enough exterior-grade paint to apply two or thee coats over the entire roof
- Probably a ladder or two
- A roller or paint brush

Now, before you start shaking your head in disbelief, thinking that this sort of roofing can't hold up very long, you should consider a few points. First, the coverings for the old-style wood-and-canvas canoes were simply cloth and paint, and some of the better maintained ones are still serviceable. And as late as World War II, many countries were putting fighter planes into the skies with exterior skins made only from painted canvas. Some of these planes are still flying.

You wouldn't hesitate to consider fiberglass, a sort of glass cloth held together by hardened resins, as a durable material. While painted canvas hasn't nearly the strength of fiberglass, it is basically the same principle, and capable of standing up to the weather at least as well.

Installing a canvas roof really does not take a lot of labor or figuring, either. To illustrate how to put on one of these roofs easily and properly, I'm going to detail how we installed a canvas roof on one of our hog farrowing huts.

This is a pretty small building, roughly ten by twelve feet, so for the cloth covering we just used old cotton bed sheets, purchased for next to nothing from a Salvation Army store.

Actually, for any smallish roof, up to about 400 square feet (20 x 20 or so), lightweight cloth of this sort is ideal. For larger projects, you'll need to use heavier-weight material, like regular canvas or duck cloth.

On our farrowing hut, the first course was installed the same way you'd put on regular roll roofing, except that it lapped over the sides and the bottom edge, being held in place by thin wooden furring strips. Only the top edge was tacked in place. A heavy coat of paint was then applied to that course. (Make sure you really saturate the cloth when applying the first coat of paint, to bond it to the roof sheathing.)

The second course overlapped the ends of the roof, and was secured in place with furring strips, in the same manner. It also lapped down for eight inches over the first course, and again only the upper edge was tacked down. This course was also given a heavy coat of paint.

That took care of one half of the roof, and the whole procedure was repeated on the other side. A narrower piece of cloth was cut to cover the roof's peak, where the cloth from the two sides didn't quite overlap. This was again fastened in place with furring strips where it lapped over the sides, but wasn't tacked down at all to the roof's surface. A heavy coat of paint was applied to this also.

For the next few hours we tended to other things that needed to be done. Then, once the first coat of paint was dry to the touch, we applied a second coat of the same paint. Then we did a third coat, after the second had dried. We were now finished.

About a week later, we got hit by a terrific thunderstorm, one of those real bucket-and-firehose downpours. I checked the canvas roof carefully, and couldn't find any sign of a leak, not even a damp spot underneath. But I hadn't expected to, because this was not my first experience with canvas roofing.

Maintenance doesn't amount to much, either. You just look at your roof from time to time. After several years, you'll notice that it will start looking sort of tired and faded. As soon as you think the roof looks like it could use it, just add another coat of paint. How long before you'll need to repaint will depend on the quality of the paint you used to start with. So the length of time between re-paintings can be anywhere from a year or so to a decade or more.

Milk paint

When the Conestogas were arriving in the western states and giving up their canvas tops for roofing material, probably the most commonly used paint for this purpose was home-produced milk paint. It wasn't anything like in the movies anyway—very few wagons were ever hauled by horses. Most were pulled along by oxen, or by three- or four-year-old cows. So most settlers could readily come by enough milk to produce their own paint in quantity.

Milk paint is just as simple to make today, and though it's not as long-lasting as the *best* commercial paints, it will outlast by far any of the *cheaper* commercial grades of paint. The best recipe I've found for mixing up this sort of paint is as follows:

- Thoroughly stir two quarts of builder's lime, ***or*** three quarts of sifted white hardwood ashes, into four gallons of skim milk.
- Next, stir in one gallon of linseed oil.
- You can also add any sort of water-soluble powdered dye, to make just about any color you want.
- Strain this paint through a piece of cheesecloth (or something similar), to remove any lumps or undissolved powder.
- ***Use within two days.***

You might think this doesn't sound like much of a paint, but this mixture bonds to wood, cloth, crockery, and such with unbelievable tenacity, and it dries to a hard, tough, plastic-like finish. In fact, many original pieces of colonial furniture, painted with this same finish, have survived 200-plus years of daily use with absolutely no signs of finish wear or fading. (Of course, they weren't exposed to the elements outdoors.) So it's well worth trying, if you have enough surplus milk to give it a shot.

Exterior grade varnishes, or polyurethane finishes, are also excellent choices for use on canvas roofing.

Gutters and windows

If this has stirred up your interest in this type of roofing, you might want to consider a couple of other uses for painted canvas as well. First, there will probably be a goodly amount of water running off your roof during rainy spells. Without proper gutters, this can lead to some real erosion problems, leaky foundations, etc. So just add some wooden gutters while you're at it, and simply extend your canvas roofing as a lining for the gutters, making them nice and watertight.

And here's another use, for anything like a chicken coop, where letting in light is important, but you don't really have to have windows you can see through clearly. You can make durable, translucent windows by tightly stretching lightweight cloth (like those Salvation Army bed sheets) on a wooden frame and then coating it with clear varnish or polyurethane. These windows will let in plenty of light; they're just not very good for seeing through. You can even make "multi-pane" or "double-glazed" windows if you want.

That's about all there is to it. Just about anyone can put a long-lasting, watertight canvas roof on just about any building, without investing a whole lot of time, money, labor, or materials. Δ

There are *lots* of tomato varieties — choose the ones that suit your garden and your taste

By Alice B. Yeager
Photos by James 0. Yeager

When the ground warms up and frost is a thing of the past (at least for a few months), gardeners' thoughts turn to tomatoes. Actually, there seems to be great haste from coast to coast to see who can harvest that first plump ripe tomato. This pits neighbor against neighbor and friend against friend. Some folks grow an early-ripening variety for the pure pleasure of gloating when they are the first in their neighborhood to pick a ripe tomato.

The first fruits of the season aren't always the tastiest, however. Wait until those mid- and late-summer tomatoes ripen. There's the peak of perfection. Given the touch of sun and showers and a longer growing period, they are juicy and packed with flavor. Even so, the first fruits of summer are always welcome, as there's nothing better from the garden than a fresh tomato after a winter of dependency on those blah ones from the supermarket. About all *they* have going for them is color.

Some of us don't give a whoop about being the first to harvest anything, as we're going strictly for good quality vegetables for culinary use, and lots of them. Sometimes we reach the point of being sick and tired of more tomatoes, but we continue to harvest until frost do us part.

Whether you live in an area with a long gardening season, or one where plants can't be set out in the garden until the end of June, there are tomato varieties that are suitable for your climate. A good place to get advice is your local county agent's office. Also heed advice given by local gardeners. Many folks don't realize that there are umpteen varieties besides the highly advertised ones such as Big Boy, Early Girl, Beefsteak, etc. Some of the new hybrids are picture-perfect in appearance but they lack quality. The flesh is mealy, and they are firm enough to be hauled a thousand miles by ox cart without incurring a bruise. That may be well for the commercial grower, but the avid gardener seeks varieties that not only appeal to the eye but can only be described as downright delicious when prepared for the dining table. Most of the home garden varieties do not ship well, and folks shopping in supermarkets never have the pleasure of eating an honest-to-goodness flavor treat.

The Thessaloniki tomato, originally from Greece, is a heavy yielder with a deep red, great tasting interior.

Trying varieties

I was born with an inquisitive streak, and I like to branch off from the well-known varieties and try some of the others. Living in Arkansas (Zone 8), where periods of high humidity and summer heat go hand in hand, I have learned by trial and error that not all varieties will grow here, even though tomatoes are generally known as a warm weather crop.

One of our favorite tomatoes is the **Thessaloniki**, originally from Greece. It is "indeterminate" (it needs staking) and mid-season bearing. It is a firm, full-flavored tomato about the size of a baseball. It has a deep red, meaty interior and is soooo good to slice and eat with toast for a snack. The plant has good foliage, and there's no trouble with cracking or sunburn. If I had to scale down to growing one

Tomatoes come in many sizes. Park's Whopper and Sweet Million are two real winners in medium and small size tomatoes.

variety of tomato, I'd seriously consider making it this one.

For a large tomato, I am partial to **Supersteak** (indeterminate and mid-season). This one is not as smooth in appearance as Thessaloniki, but it has good flavor and a slice will cover a slice of bread and hang over the edges. Fruits generally weigh about two pounds and have good texture.

Quick Pick (indeterminate) is an early variety, as the name suggests. This is a medium size tomato with good flavor and will continue to bear until frost. Fruits are round but have an odd feature: they have a tiny point on the bottom. These tomatoes are just the right size for canning whole.

An oddity is **Evergreen** (indeterminate and mid-season). When ripe, these tomatoes show a slight tinge of yellow and are medium to large size. Evergreen has good flavor and texture and has a unique appearance in salads. In our garden, this one had a problem with wilt, leaving plants that were loaded with tomatoes but were goners.

We like to grow **Arkansas Traveler** (indeterminate and late-season). It is a hot weather plant and will continue bearing until frost. Flavor and texture are good, and the tomatoes are about six to eight ounces in size. They are very good in salads and slightly less red than other tomatoes, thus providing variety in color.

Always leave room for a few small tomatoes. Generally speaking, these will need staking unless you are growing the patio varieties. Sorry, but I think the garden-grown ones have better flavor. One of our favorites and a heavy bearer is **Sweet Million**. It has a sweeter flavor than other cherry tomatoes and is a delight to pick and eat right from the vine while doing garden chores.

Growing tomatoes

All of our tomato plants are started in our small greenhouse, where we plant seeds in a heat-controlled seed starter, then transfer seedlings to styrofoam cups (with holes punched in the bottoms for drainage) or small plastic pots filled with a good quality potting medium.

When the danger of frost is past and the ground has begun to warm up, plants are about a foot high and ready to be *hardened off*—that is, given a few hours of sunshine outside the greenhouse each day for several days in a spot protected from wind. We gradually increase the time of exposure until we know they are ready to move to their permanent place in the garden with no danger of *sunscald.* (Sunscald is over-exposure to the sun that causes leaves to bleach and severely damages plants.)

Tomatoes like a sunny spot in loose, moderately rich soil with a pH of 6.0-7.0. Every gardener who raises tomatoes seems to have a favorite method of planting. In our case, we have to take into consideration the fact that Mother Nature has a habit of turning off her water supply in mid-summer, leaving us to improvise if plants are to live through the dry season.

One preventive measure we use against drought is to plant the tomato plants deeper than we might in a cooler climate. We dig the holes deep enough to accommodate about a third of the plant, fill in plenty of well-rotted compost around the plants, and then water them well to eliminate any air pockets around the roots. Tomato plants will put out additional roots wherever the soil touches the main trunks, giving them access to moisture as well as providing good anchorage. Depending on the varieties, plants are spaced about 18-24 inches apart.

We also place a light organic mulch of leaves and pine needles around the plants at the time of planting. This prevents soil from splashing up on plants when heavy rains occur and also keeps the ground from crusting when it dries out. We add to the mulch as summer heat comes on to help retain moisture. In so doing we create a haven for earthworms—those diligent tillers of the soil.

Once our plants are in the ground and the earthworms take over, we forget about cultivation. However, a really tough dry season will bring out the water hose.

We set stout cages made from concrete reinforcing wire over our indeterminate varieties, which then grow

A real summer treat: stuffed tomatoes with slices of Evergreen tomato

up inside the cages. That makes for a lot less work than staking each plant. We drive in two short, stout stakes opposite one another against the wire inside each cage to assure that the cage will remain upright in strong winds.

Pests and diseases

Our main pest to combat is the **tomato hornworm**—that big, green, striped fellow with the horn on his tail. He has a voracious appetite and can consume quite a bit of foliage, as well as young tomatoes, in a few hours' time. Handpicking is the best and safest way to get rid of hornworms.

If **cutworms** are troublesome, a bit of 5% Sevin dust sprinkled on the base of the plant's trunk will solve the problem. After plants have matured and are out of the tender stage, cutworms should be no problem.

Tomato plant diseases—**wilts**, **mosaic**, etc—can best be dealt with by planting disease-resistant varieties. Also, if **nematodes** (tiny eel-like worms that live in the soil) are a menace, seek out tomato varieties that show the letter "N" in the first part of their catalog description. For instance, Hybrid Beefmaster is VFN. "VFN" means "resistant to verticillium and fusarium wilts and nematodes."

Seldom is there any **bird damage** to our tomatoes, but I often hear complaints from friends about birds ruining their crops. Birds can be discouraged without resorting to violence. Just take some *dark* colored sewing thread and loosely tie pieces at random among the plants, being careful not to tie thread too tightly around the stems and thus interfere with the plants' circulatory systems. When birds fly into the threads, it startles them, and they will avoid the plants. (Maybe they think they have encountered a stout spider web.)

With all the variety we have in tomatoes—new ones as well as old standbys—no one should be bored with raising the same plants year after year. Give yourself a treat and explore. If you don't have much room, try some of the determinate varieties (which need only slight support) and patio varieties. Bush Beefstake, Celebrity, Pilgrim, Red Robin, Pixie Hybrid—the list goes on and on.

Reap your harvest and enjoy.

Some seed sources

Tomato Growers Supply Co.
P.O. Box 2237
Fort Myers, FL 33902

Geo. W. Park Seed Co., Inc.
Cokesbury Road
Greenwood, SC 29647-0001

W. Atlee Burpee & Co.
Warminster, PA 18974

J. W. Jung Seed Co.
335 S. High Street
Randolph, WI 53957-0001 Δ

When a just cause reaches its flood tide…whatever stands in the way must fall before its overwhelming power.
Carrie Chapman Catt
1859-1947

My dog is old.
She limps.
Lying down and getting up
Come at great cost
And even her bark is gone.
(A stroke, the veterinarian suspects.)
It's hard to believe
She was once the guardian here
Whenever I was gone.
Now, she's just underfoot.
I keep her for no practical reason.
I hear her moan
And look down at my feet where she's sleeping.
Her legs twitch.
She's dreaming.
In a world only she can visit
She still runs like a dog.

John Silveira
Ojai, CA

A BHM Writer's Profile: Judith Monroe

Judith Monroe adopted Maine as her home state 40 years ago after emigrating from rural upstate New York. She raised three kids who, in turn, are raising their children—all in Maine. She has always loved dogs and has owned a succession of shelter foundlings. The one pictured here was a hound friend and a singer who needed just a little encouragement to sound off.

Her most recent acquisition is a Celtic harp which she found also sings on its own with a little encouragement—from the wind. Monroe is currently working on writing humorous prose and serious poetry.

A brick walk with little work and less money

By Robert L. Williams III

Because we often leave our house by the basement door, we have to cross 30 feet of often wet and muddy yard in order to get to the drive. What was needed, we decided, was a wide and rustic walk that could be built with very little work and practically no money.

We considered several options, but when we learned that used bricks were available to us at no cost, we decided immediately on the type of walk we would build. What we did can be done by virtually anyone with a little patience and energy.

Preparing the surface

The first step is preparing the surface of the soil. This means digging up and removing rocks, roots, and anything else that is in the way. This includes grass. What you want is a wide stretch of space that is nearly flat and ready to work. You may need to dig out enough soil so that you will have room for sand and bricks needed for the walk. If you don't use sand as a base, you may find that the bricks will sink in wet weather and in very heavy traffic.

Figure 1. Use a trowel to smooth the sand for the next bricks.

Once rocks, roots, sand, and dirt are removed, locate some timbers (treated ones work well, but untreated timbers will last for a fairly long time and be replaced inexpensively, if you decide to leave the timbers in place) and line the walk area on both sides with these timbers. Then dump bucketfuls of sand between the timbers and rake the surface smooth.

If you prefer, you can put down a layer of black plastic before adding the sand. The plastic will help to prevent grass and weeds from coming up between the bricks. You can buy masonry sand, but this is expensive. You can use creek sand, as we did, and save money. The creek sand works beautifully once you discard pebbles larger than a marble.

Laying the bricks

Work in sections of about three feet at a time. Start with bricks stood on edge that are placed parallel to the house. Lay about a dozen of these bricks and then start a row of bricks perpendicular to the house. These bricks are started at the ends of the first bricks. You may choose to align these bricks exactly or you can, as we did, choose an irregular pattern.

One problem you may face is locating bricks that are free or very inexpensive. We found that a local community college offered courses in brick masonry. The students used a mortar made only of sand, lime, and water for their projects. Once the bricks had been used, they were not re-used and were free to anyone who wanted to haul them off. On weekends, we drove to the college and hauled 500 bricks per load until we had several thousand bricks on hand.

Figure 2. Lay a series of bricks, tap them down with the hammer, and level them. Notice the irregular exterior bricks that have already been mortared into place.

Our only cost was the expenses of operating a pick-up truck to haul the bricks.

We learned quickly that the mortar could be knocked loose with very little effort. We also learned of dozens of other places where bricks could be had for the asking. Some had to be cleaned of old-fashioned mortar, but we couldn't beat the price.

After positioning half a dozen bricks, as described above, use a level to check your work. If a brick is too low, lift it and put more sand under it. If it is too high, simply rake some of the sand away.

If your work satisfies you, keep placing bricks on edge until the first course is within eight inches of completion. Then, as you did in the beginning, turn the bricks until they are, again, parallel to the house. You may find that 20 bricks, plus the edge

bricks will make a sufficiently wide walk. Sixty bricks, plus the edge bricks, will produce roughly three feet of linear surface.

Remember that you do not use any mortar of any sort between the bricks. You simply set in your edge bricks and then your interior bricks and proceed toward the end of the walk.

When you have completed the basic walk, you may wish to leave the landscaping timbers in place. Or you may remove them and leave only the edge bricks. Treated timbers can be costly, and in a typical walk, you may need as many as eight or ten timbers.

Earlier, I suggested that you use untreated timbers because you can move them as soon as one section is finished and remove them completely when the work is done.

One option is to go back after the interior bricks are laid and remove the edge bricks, a few at a time, and apply a bed of mortar where the bricks had been. Then "butter" the edge bricks and replace them. By doing so, you will have stationary bricks that will hold the interior bricks firmly in place.

When you come to the end of the walk, you can use a series of thin, flat rocks as the stepping-down area, or you can pour either concrete landing or a gently sloping terminus. Either way, you have rescued perfectly good bricks, helped reduce the loads of debris in the landfills, and in the bargain, you provided yourself with a delightful and useful walk that can also add beauty to your home. It is a bargain that is hard to beat. Δ

A BHM Writer's Profile: Jeff Fowler

Paul Jeffrey Fowler resides in Worthington, Massachusetts, in a passive-solar, solar-electric powered home with his family. He founded, developed, and later sold Fowler Electric, Inc., a successful business that supplies alternative energy components to power remote homes. Fowler wrote several successful how-to books and booklets on solar electricity while working at his former business. His most current book is The Evolution of an Independent Home; The Story of a Solar Electric Pioneer. Fowler has a B.S. in Biology from Tufts University and Masters Degree in Environmental Studies from Antioch New England Graduate School.

A BHM Writer's Profile: Bill Palmroth

Bill Palmroth pursued a newspaper career for 20 years, starting as a sports writer for the Grants Pass Daily Courier in 1958. In 1978 he started Media Specialist, an editorial and publicity service business. Loggers World Publications, in Chehalis, Washington, became one of his clients and he did field work for their logging magazines for five years before joining the company full-time in 1989. He then served as editor of the company's Log Trucker magazine for six years before moving to Belfair, Washington, in 1995 to become editor of the Belfair Herald. Over the years Bill has written articles for numerous outdoors and self-sufficiency magazines. As of 1999, he now operates his own store, Mr. Bill's Sportcards & Variety, in Belfair.

Lessons I learned while building my log home

By Dynah Geissal

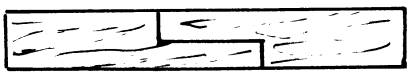
When building a log home, the first order of business is getting your logs. Ideally you cut and deck all your logs in the beginning. We were unable to do that because we had so little time. We spent the weeks cutting, milling the logs to a uniform 6" width with our homemade Alaska Mill and transporting the logs that were manageable for the two of us.

On Saturday afternoons we had volunteer help so we needed to have enough logs ready to keep everyone busy. Twenty foot logs could be carried by six people using three steel bars. Thirty foot logs required eight people (the most we had available for carrying) and it would have been better to have had ten.

We milled the logs where they were cut so that they would be easier to carry. Many of our logs were ten feet and these we could carry to the site ourselves.

Selecting your logs

Your sill logs should be the strongest, straightest logs you have other than the ridgepole. Ideally they should be standing dead although ours were green. We cut half laps at the ends with a chainsaw and a chisel. To do that cut half the depth of each log and as wide as the log that is to lie on top of it. Either make a vertical cut and meet it with a horizontal cut or make multiple vertical cuts and hammer out the pieces and finesse with a chisel. It will look like this:



Be sure the sill logs lie firmly on the piers. If they don't, use wood shims (hardwood is best) until they do. Besides the sill logs we have a sleeper which runs the length of the house and rests on the short end logs as well as on three wooden piers. We were advised that the 20 foot width of our house was too wide to use only the sill logs and that the sleeper down the middle would greatly improve the strength of the house.

The short end sill logs do not run the entire width of the house because our house is on a slope. They go from the downhill pier to the center. A second log does the same. The third log lies directly on the uphill pier.

We were advised to put up three support pillars which would rest on the sleeper above the wood piers. These support the cross ties and ultimately the ridgepole. These pillars are 10" in diameter and 8' tall and were dead when we cut them.

Once again I wish we had time to study this for ourselves. I believe one support pillar would have been sufficient. Of course, the three add to the strength and stability and they do look good, but they take up space and they divide the house, taking away from the open feeling we wanted.

If you do put up pillars they will have to be braced until they are attached to the cross ties. Support pillars are necessary only if you plan to have gales and, as I said, I really think three is overkill since we also have vertical poles in the gables which support the ridgepole.

The beginning of the construction of Dynah's log home.

Putting in the floor

Now you will need to decide whether to put on your floor or to wait until you have the roof on. We salvaged our flooring from a lumber mill. We bought pallets made of 2 x 6 tongue and groove boards which we had to dismantle. The pallets had been sitting out in the weather anyway so we weren't real concerned about them getting a little wet once they were nailed into place. Of course, when they were stacked we kept them covered so that they didn't warp. Another factor in our decision is that we only

get 13" of precipitation for the entire year and most of that is from snow during the winter. So, in order to have a solid place to work inside, we opted to put in the floor.

We used the 2 x 6 tongue and groove boards for our joists also. We set them on edge 16" apart and secured them to the long sill logs and to the sleeper with joist hangers. Be careful with your measurements to avoid great frustration when you're flooring.

We chose the nicest boards for our floor, cut them to varying lengths of multiples of 16 and using finishing nails, nailed them to the joists. Two nails were used to secure the ends and the middle was toenailed in with a nailset used to countersink each nail.

Because our boards were used, there was some warpage and so the boards did not always fit together easily. When that happened we fit a third scrap board over the one to be nailed. Standing on the one we wanted to secure we smashed the third board with a sledge hammer. Usually that did the trick, but with an especially recalcitrant board we had to nail in one end and have a helper hold in the other end while it was hammered.

The house is divided by a step down which runs along the sleeper. The uphill side rests on top of the sleeper and in joist hangers on the sill log. Both sides rest in joist hangers on the downhill side thus creating the step down. We started flooring at the step-down reasoning that it would be easier to begin square when we didn't have to worry about the fit against a log. At the end we ripped boards to fit against the logs. We used relatively short boards because they were easier to custom fit.

Locating your doors

There are a number of things to consider when deciding where to put your doors. I believe every house should have two doors as a precaution against fire. They do take up quite a bit of space in a small house, but I think it's necessary anyway. So, where do you put your doors?

The short sides of our house face east and west. We were told to put the doors on those ends because you can't have your doors under the eves without building an additional roof. If you do, rain and snow will be pouring off your roof just outside the doorway. Made sense at the time. However, our prevailing winds are from the west and it is bad planning to have a door facing the prevailing winds. It is even unwise to have a door facing the opposite of the prevailing wind because it will always suck the wind inside. When our doors are open we have a virtual wind tunnel. In the winter we had to seal the door facing west. Not good. So besides possible thoughts of convenience or aesthetics, consider the wind and never have two doors directly opposite each other.

The walls go up.

Securing supplies

A word about supplies: prices vary tremendously. Be sure to shop around. At our "farm needs" store boxes of nails were 2/3 the cost of the same thing at the building supply store. We could get almost everything we needed there and the prices were always better.

We used 15" - 5/8 rebar and 10" spikes to anchor the logs. We used 7" spikes at first, but decided they were too small. In the beginning we used a brace and bit to drill the rebar holes and it was extremely difficult, but possible. Happily, a friend loaned us a generator and so then we were able to use an electric drill.

On the advice of more experienced people we put sill seal between the logs. When one log was anchored to the one below it we attached sill seal with a staple gun before placing the next log on top. The theory seemed good and my husband still thinks it was a good idea. I'm not happy with it myself. For one thing it's extremely expensive and for another it's plastic. It just doesn't seem to be in keeping with everything else involved in the construction of the house. The third and I believe most important aspect is that as the logs shrink there is space between them anyway and the sill seal inhibits filling these cracks with insulation. We have friends who are presently building a log house. They are cutting strips of fiberglass insulation and placing them between the logs. I think that will turn out to be a better alternative.

It is not necessary to have full length logs in most parts of the structure. The ones you do need to have full length are the sill logs and the logs directly above the windows and doors.

If you have the time you'll want to peel the inside and outside of your

logs. We didn't so we did only the inside. It's easiest if the logs are off the ground so you don't have to bend over so much. Some drawknives are vastly superior to others - I like the old ones with thin blades. The new ones usually are much thicker and I don't like to use them. Always peel your logs when they are alive because, when dead, the cambium layer will adhere to the log.

Setting the logs in place

When you set the logs in place line up the logs as you look from inside the house. Outside they will not be uniform. If you don't do that it will be very difficult to hang shelves or whatever.

Even though you've milled the logs to a supposedly uniform size there are always going to be imperfections so keep your level handy and check after each log is placed. Shim when necessary. We had so many people working and were in such a hurry that levelling and plumbing didn't always happen when they should have. Brace the walls as they go up to keep them plumb. They will have a tendency to creep outwards. You'll need to decide how your walls are going to meet. What you choose will be somewhat determined by how much time you have. We had planned to use rabbit joints and indeed our first two logs (other than the sill logs) have them. We decided, however, that it was much too time consuming. We chose instead to use a half butt technique. In this method you alternate which logs butt up against the other. The short side is butted on one row and the long side on the next. You can make the long ends uniform or not, but it's best to leave them long until the house is finished. Then you can cut them all at once when you see how it looks. In any event, when you do cut them they need to be under the eaves. If they're sticking out they'll be exposed to the elements.

The log home before the roof went on.

When your logs are not full length join two shorter ones with a half lap as you did with the sill logs. The longer the "tongue" is the better—up to about three feet. Use your spikes to secure these joints. You will also want to spike every log every three feet or so and at each end. Your pins (rebar) go through or into 3 logs. They are staggered to give an equal distribution of strength. There should be one near the ends of the logs and every five feet or so. Mark where you put these with a pencil and also where you put your nails. That way you won't end up trying to drive one into another. Also, if you later want to cut into the wall to enlarge a window or some such, you'll know where the hardware is.

Planning your windows

When you have three tiers of logs up you'll have to plan for your windows if you haven't already. Windows are terribly expensive if you have to buy them new. Let people know you need them and check for demolition sites. Even rummage sales sometimes produce used windows. Glass stores sometimes have improperly sized thermopanes. The first time we salvaged windows it seemed to take forever to get the first couple out, but we rapidly became proficient so stick with it.

After you have your windows you need to consider their placement. Books tell you to place your biggest windows facing south. In my case, however, south faces the road. My north side faces the meadow, which is my view of choice. Because we rarely have winds from the north we placed our biggest windows there. On the east end we only have one tiny window and that's really a mistake. We actually open the door on that wall in the mornings to let the sun warm up the house. Silly.

The other thing to consider is the height of the windows. Some windows you'll want to see out of when you're seated and so they will be placed differently than ones where you will most often be standing. In my living room area the windows are too high for when I'm seated. The one above the kitchen sink is so high I can hardly see at all. Part of the problem, I think, is that most of the people helping us were taller than I am. The rest

The log home completed

is just that I didn't have the time to get a feel for what I wanted.

In my case there is also the question of what part of the surroundings do I want to see—the mountains, the sky, the meadow or the yard? I find it frustrating to look out a window and see trees and sky, but not what the puppies are doing in the yard.

Another important consideration is the sun. In the north where I live I want the sun coming in all year. There is never too much and so I don't need to worry about letting it in in winter and keeping it out in summer. If you possibly can, experiment before you put in your windows. Put a chair in your unfinished house and see where a window should be. We managed to place two of ours well. Whether I'm sitting or standing I see the yard, the mountains and the sky.

We made our doors and window frames with our Alaskan mill. They are very attractive and fit the style of the house. We ripped 3 x 8 boards for the doors and 2 x 8s for the windows leaving the inside edge unripped for a natural affect. The door sill boards (also 3 x 8) are laid directly on the sill logs. If you are using green logs leave a 4" space above each door and window to allow for shrinkage. Only 2" are needed if cured logs are used. Frame in the windows and doors, but leave the glass until the end to avoid breakage.

We installed used doors which saved us a great deal of time. They are good quality, but someday we'll make our own.

When you are ready to resume setting logs, use full length ones above doors and windows. When the windows are not all the same you may have to make the whole log the second one above the openings. These logs are called tie logs and are important for the stability of the walls. The top logs should also be full length. The ones on the long side are called plates and directly support the roof.

We were advised to use three cross ties, logs which are placed on the plates and across the width of the house. They rest on the support pillars. Two support the loft, otherwise, I believe, one would have been sufficient for a 20 x 30 cabin, but the three do look good. We left a 4" space between the support pillars and the cross ties to allow for settling. Into that space we drove wedges which theoretically could be gradually worked out. Rebar is driven through the ties and into the pillars.

As with the rest of the house, we are getting shrinkage, but minimal settling. This seems to be mainly due to the spikes we drove through the window and door frames into the logs. We finally had to cut them out and drive in 20 penny nails which stabilize the frames but yield to settling.

Locating a loft

If you intend to have a loft, now is the time to make your plans. We made a great mistake in having ours at the west end of the house. It is so dark in the mornings that I have to look up at the mountain tops to see if the sun is up. This, despite the fact that our one window is quite large. What a joy it would be to wake to a lightening sky instead.

Another consideration is where you will spend your evenings. Our living room area is directly below the loft. The heating stove is there and if it is warm enough to be comfortable sitting there, the loft is outrageously hot. This is greatly exacerbated by the fact that we did not build the loft floor all the way out to walls of the house so that hot air billows up from the stove directly into the sleeping area. A ceiling fan would remedy much of this, but the DC model is very expensive. The kitchen area is quite cold at night and we rarely keep the cookstove fire going after dinner. So sleeping conditions would be better there.

The final consideration is this—we have beautiful cathedral ceiling above the kitchen, but where we sit in the "living room" we look at the underside of the loft floor.

O.K., now for the actual building of the loft. We milled 3 x 12 joists with our Alaskan mill. The joists are notched where they lie over the two cross ties and the top log of the wall. They are spaced 18" apart. At the place where the stairs would be we made one joist about a foot shorter to allow for a landing. The most distinctive 3 x 12 finishes the front edge of the loft.

If we had it to do over we would make the loft the width of the house. We have a great lack of storage space and the area too low to be of other use could have served as storage.

For the loft flooring we used the same tongue and groove 2 x 6's that we had salvaged for the main floor.

Putting in the gables

Now is the time to determine the pitch of your roof. Talk to people who live in your area and research articles and books on the subject. Our roof is 10-12 on one side and 12-12 on the other. This means that for every 10" up you go 12" out. (See Figure 1.)

The reason they are not the same is that our step down is not in the center of the house. That means that the pillars are not in the center. In other words, one side of the house is wider than the other and so the roof angles cannot be the same.

There are many ways to build gables. The method we used was fast which was our primary concern as it was already Nov. 19 when we built them. I wanted them to be made of logs, but there was no time, and the weight of the logs at such a height seemed prohibitive without fashioning a way to lift them other than by human power. I would have been happy if we could have used boards, but there was no money to buy them and no time to mill them.

To my horror a friend brought up a load of pressboard that was left over from a construction project. I had been adamant that I would not use any plywood, particle board or anything similar in my house. But then it became apparent that the supplies were there and I could either use them or forget getting into the house before winter. Now, the outside is covered with the slabs which were milled from the house logs and the interior is finished with beautifully colored 1 by's which we milled. It looks great.

We built the gables from pressboard framed with more of the salvaged 2 x 6's which were also attached as nailers. A support log 6" dia. extends from the top log of the wall almost to the peak of each gable allowing enough space on top to support the ridgepole. We built the gables on the loft. One was erected directly from there and we slid the other one across to the scaffolding waiting at the other end.

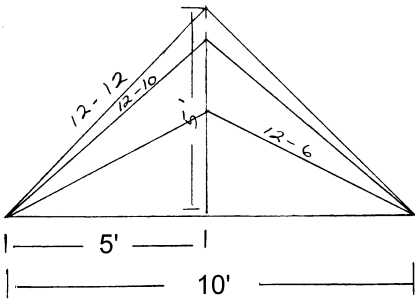


Figure 1

Lifting the gables into place was very exciting. It is very important to brace the gables until the roof is on. We used 2 x 4's for that.

Installing the ridge pole

Next comes the ridge pole. Let me tell you that getting that up even with lots of bodies was quite a job. We had saved an especially fine, but even more importantly, a cured standing dead which was near the house. First we got it up on the top log and pushed it up to its pivot point. Then we had to get one end up the scaffolding and the other onto the loft. The end on the scaffolding went up onto the gable first. Then we slid the other end up the side of the gable which was no easy feat. It was wild and scary and almost dark, but finally it was up. Hurray!

Now you need to fill in the short logs that fit between the crossties because they will support the rafters. We used 5" poles for the rafters and spaced them 3 1/2" apart. They are spiked into the ridge pole at the top and the short logs and cross ties on the bottom.

When we had the rafters up we covered the entire roof area with blue plastic tarps. It was quite cold and snowy and even though we had a heat stove in the house it had become unpleasant to work. At that point we had to vent the heat stove through a window opening to avoid melting the tarp.

Next we installed the doors and windows and the cookstove which we

Dynah in her new log home.

also vented through a window. We installed insulation above the windows and doors where we had left space for shrinkage and settling. Someone had given us some cans of foam insulation which we sprayed in the corners and in the bigger gaps. While it did temporarily stop the wind it was actually a mistake to use it because it masks the openings if you aren't very thorough. You think it's closed off, but, in reality, it's only a thin covering between you and the outdoors—virtually useless, very expensive and ugly to boot. Don't waste your money on it. Later on we had to cut a lot of it away in order to chink properly—a real drag.

In order to maintain the integrity of the ridge

pole we placed two 6" dia. logs on top of the two of the cross ties above the pillars. These were notched to fit around the ridgepole. We didn't put one on the third because it is under the loft. For structural support of the gables 4" diagonals were placed from the pillar to the gable top and from the same pillar to the next ridge pole support.

Our next step was to insulate the windows between the frames and windows themselves and to insulate the gables.

The spiral staircase to the loft.

And then it was Nov. 24 and Thanksgiving. We brought in sawhorses and the beloved particle board and our family and friends piled upon it the most wonderful feast. The first of many in our new home. They had to bring their own chairs, eating utensils and candles. We managed to get most of the ice scraped from the floor and made a couple of benches from slabs and logs and had a very grateful day.

When we put in the floor we started in the middle at the stepdown. There was a space between the final boards and the bottom logs so at this time we custom ripped some more 2 x 6's to fit in those spaces. It was slow and tedious, but it stopped cold air flow which was great.

Building the spiral stairs

The weather was pretty bad at this point so instead of working on the roof we did indoor construction such as installing more structural support poles, planing and sanding the floors and beginning the spiral staircase which connects to the middle support pillar.

The spiral staircase has its pros and cons. It is very attractive and in a way is the focal point of the house. In reality, I guess, that's all I can say in favor of it. It really breaks up the house which is one thing we wanted to avoid. Our house is only 30' long and yet when one of us in the kitchen and one in the living room we can't see each other which makes conversation difficult. We're forever walking around the staircase to talk. Maybe even more importantly it takes up a lot of room. We had opted for one open room to give us the illusion of space, but then here is this big staircase right in the center of the house.

Another disadvantage is its unsafeness. Maybe if it had been built by a real professional it would be safer, but while the bottom steps have plenty of tread the top ones are sort of crowded together so that it's impossible to put a foot flat on the steps. In other words, we ran out of room. In addition, the railing is too low so that instead of using it we hold onto the cross tie and pillar when we go down.

I'll tell you how we built it in any case. Maybe you can correct our mistakes. The bannister or uprights that support the handrail are 3" poles. At the bottom they are spaced 12" apart which seems about right and toenailed into the floor. Each one is notched to hold a stair and the pillar is notched to hold the other end. The stairboards are 3 x 7's that we milled and 27" long. They are spaced for an 8" step. Our hand rail is about 28" above each stair and is made from peeled chokecherry whips.

Besides being toenailed the uprights are also glued to the floor. The stairs are spiked through the uprights and into the stairs and toenailed through the stair into the pillar. The top stair "floats" until the house settles. It is on top of the support pillar with a wedge between it and the pillar. There is a diagonal support from the pillar to the other end of the stair. That is because we cut off the upright to give us more space.

The landing is made of 2-2 x 6's. 2 x 8 boards form the 3 sides between the floor of the landing and the loft floor.

The weather remained poor so we put up more 3" poles, partly for support, mostly for aesthetics. We also installed cripples which are short 4" poles placed at an angle from the wall to the crossties. We worked, seemingly forever, planing and sanding both the main floor and the loft floor. Then we oiled the floors with soy oil. We used that because we could buy five gallons for $18.00—a real bargain. The floor looked very beautiful when we finished.

A friend gave us a DC light so we installed it in the kitchen and attached it to a car battery. We began spending more of our evenings in the house instead of the tipi. We would stay

each evening until it got too cold to sit there.

When the weather finally improved we began again to work on the roof. We used salvaged 2 x 4's for purlins which we spaced two feet apart. On top of and perpendicular to the purlins we placed 2 x 6's on edge directly over the rafters. That allowed us space for R-19 insulation while letting the rafters show from inside. Over these "rafter extenders" we put more 2 x 4 purlins which serve as nailers for the metal roof. This was a lot of work and material whose only purpose was to have the rafters visible while still having space for the insulation.

Let me emphasize here how important it is to level and plumb continually. Some of our volunteers neglected to do that. The result is that every ceiling board has to be custom cut taking a tremendous amount of time. In addition, our roof is not square. So be sure to take the time. Eyeballing really isn't good enough.

Putting on the roof

Finally it was time to put on the roof. Along with insulation it was our main expense. We decided to buy new metal roofing and although we would have preferred green, we could not justify the added expense. Let me stress that metal roofing is the ONLY intelligent choice in the woods especially when we are miles from even a rural fire district. A roof of any other kind is simply not defensible in forest fire country.

When putting up the first sheet be absolutely certain that it is squared. Also, leave enough overhang for installation of the facia. Count the extra expense of roofing screws over nails as well worth it. Before installing the ridge cap attach screening to keep out insects.

We couldn't afford to insulate the floor so we just did the perimeter which helped some. It's a year later now and we still haven't done the entire floor. There's always something else that seems more important, like land payments.

Dynah in the kitchen of her new log home.

We moved our solar panel and the two DC lights and the radio up from the tipi and our furniture from the shed and the house began to feel like home. We moved in on the winter solstice just in time for another holiday dinner with our family and friends.

We had salvaged some maple panels that measured 32" x 37" x 2 1/2 from a drugstore that was being remodelled. After much restoration we were able to use them as countertops. They are really beautiful now. They are supported by 3" poles. We used a hole saw to make holes in the walls of the appropriate size and inserted the poles. They are supported by diagonal poles.

Some friends salvaged a stainless steel double sink which set into one of the counters. Our water barrel sits on a platform nine feet above the floor and gravity feeds the cold water faucet. A metal cylinder sits on the woodstove and a hose connects it to the hot water faucet. The drain pipe goes under the house and into a gravel spillway.

For shelves we milled 2 x 12's and used pole supports that are inserted into the walls in the same manner as the counters. These work well and look nice, but we used uncured wood and they began to sag as they dried. We shimmed them, but eventually we'll replace them.

We vented our heat stove through the floor so that the warm air would not be drawn from the house, thereby pulling in cold air from outside and we insulated around the stovepipe. Every day we stuffed more insulation into cracks.

We milled l by boards to cover the gables and the ceiling. As we milled them we kept them in order so that the grain and color have continuity. The boards for the gables are placed diagonally and the effect is very attractive. The ceiling boards run horizontally between the rafters. Milling all the boards is really time consuming and we still haven't finished, but we appreciate each board.

One of the last major tasks for our house was fabricating a tower for the wind generator, but that's another story. Δ

Ayoob on firearms

By Massad Ayoob

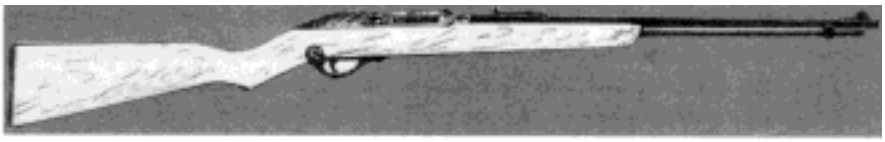
The Marlin Model 60 — It's the classic backwoods home rifle

Massad Ayoob

I recently bought a Marlin Model 60 .22 rifle. I needed it as an exemplar for a murder trial. An "exemplar" is an item identical to the one in evidence, which often cannot be accessed by defense experts.

The case involved a man who shot another man in his backwoods home. He claimed it was self defense. The prosecutor thought it was murder in the first degree. A single bullet had stopped the menacing giant who was moving toward the compactly-built 68-year-old householder. It caught him under the pectoral muscle, knifing through the liver and stopping in the spine. He died about an hour and a half later.

The Model 60 was designed to hold 17 cartridges. This one had been loaded with 12. The defense wanted to show that if murder had been intended, the defendant could have hosed a dozen bullets into the deceased instead of the one, or could have shot that man and his companion six times each. Hence, the exemplar rifle.



Most of my work involves firearms more potent than the Marlin .22, but working with this gun as we prepared for trial gave me an appreciation for it. When I tested it at the range, the first five shots (using Remington's lead bullet standard velocity round) grouped into half an inch at 50 feet. That's not the precision you'll need to win an NRA rifle match, but it's very good indeed for a mass-produced, low-priced semiautomatic rifle.

I suspect the accuracy comes from Marlin's patented Micro-Groove rifling, a 1953 innovation. The same feature has always made their Model 336 the most accurate of lever action .30/30 deer rifles. I have one that shoots just over one-inch groups at 100 yards. Instead of the standard rifling of five to seven deep grooves, Micro-Groove features many more grooves, cut more shallow.

I would never recommend a .22 for self defense unless the user was so physically challenged he or she could not handle a more powerful gun. That said, if I had to defend myself with a .22, I'd definitely want it to be a semiautomatic rifle containing lots of cartridges. (The integral tubular magazine of the Marlin 60 apparently does not come under the wording of the Clinton Crime Bill's ban on removable box magazines holding more than ten cartridges, colloquially known as "clips.")

In performing the tests requested by the defense lawyers, I was able to pump a dozen Winchester high speed hollowpoints (the same load used in the shooting in question) into the middle chest area of a human silhouette 12 feet away in 2.5 seconds. The next test—one silhouette in the same place, another about eight feet to the side and another three feet further away—resulted in 12 shots fired in 3.67 seconds, leaving each target with four hits in the middle chest and two in the head.

The rule of thumb is that with a short-trigger-stroke semiautomatic firearm, the average person can fire about five shots per second running at maximum speed. The thing with the recoil-free .22 rifle is that the running person can actually hit what they're shooting at, if they have a reasonably good idea of what they're doing, and are at reasonably close range.

Fortunately, the average purchaser won't need the rifle for this grim purpose, and will have a more potent firearm in the home should such a need arise. Where the Marlin shines is as a fun gun. The factory describes this rimfire as intended for small game hunting and "plinking," or informal target shooting. It should also do noble service for eradicating rural pests. A gun that puts every shot inside half an inch at 50 feet is all you need to permanently adjust the attitude of the freeloaders of the wild who believe your family garden is their salad bar, and it's accurate enough for barn rats and other disease-bearing vermin.

Between seven and eight million of these rifles have been made since the model was introduced in 1960. For the

last decade, the factory has been producing about 200,000 of them a year. A lot have been sold through mass-merchandisers such as Wal-Mart. Many were produced for Sears under their J.C. Higgins private label (and, I suspect, their Ted Williams signature sporting goods series); for Montgomery Ward under their Western Field label; and for Western Auto stores as the Revelation brand. A great many were also marked Glenfield, Marlin's own economy grade in-house brand.

Current suggested retail is about $158, but it's almost universally discounted. Though I generally prefer to buy guns at gun shops (better point of purchase service, more knowledgeable advice, better follow-up service), none of the local gun shops had one in stock, so I had to go to a Wal-Mart. One store was retailing Marlin 60s for $123, but was out of stock; the other listed them for $97 and had one left. That one had gone back to the factory for reasons the clerk was unclear about, so I got it for $80. It worked fine. That's about the right price for a good used one. Use of cheap birch instead of traditional walnut for the stock, and other production economies that "take out the fancy and keep the performance" has kept the price reasonable.

Mine doesn't have a scope on it yet. If it shoots a half-inch cluster at 50 feet with the simple iron sights (post front, notch rear), Heaven knows what it'll do with a good glass on top. Any time you scope a .22, by the way, you'll be wise to avoid the narrow-tube models built expressly for that caliber gun. They tend to give a poor field of view and gather little light, and they don't stand up well to heavy use. A budget version of a high-power rifle scope with a full one-inch diameter tube is always a better choice. The optics are far superior, you'll shoot better with it, and it's much more likely to stand the abuse of farm use, particularly the constant vibration and jarring of riding along when you're on truck or tractor or snowmobile. (I've heard it said that the mark of the master rifleman is that he often pays more for his telescopic sight than for the rifle under it.)

At the age of four, I fired my first gunshots with an autoloading .22 rifle similar to this one (but no longer made), the old Stevens Model 87. I've found myself taking my new exemplar gun out to the range and shooting just for the heck of it. I haven't exactly rediscovered my childhood (though there's some speculation I might be entering my second one), but I've enjoyed shooting this inexpensive, lightweight, accurate little rifle.

Millions of these modest Marlins are everyday working tools in rural homes for pest eradication and the gathering of squirrels and rabbits for the larder.

If you know your livestock anatomy, such a rimfire rifle is all you need for humane slaughtering. A .22 bullet almost invariably stays inside the brain cavity of a steer or hog, but when placed in that brain, it kills as quickly and painlessly as a more powerful gun.

Marlin's Model 60 is a gun well suited for the lifestyle that *Backwoods Home* celebrates. It's plain, economical, unpretentious, and always seems to work. It does the job. It's fun. You can pass it on to your kids. It's the embodiment of backwoods living, rendered in birch stockwood and blued gunmetal. Δ

A BHM Writer's Profile: Allan and Marjorie Harrison

Marjorie and her husband, Allan, have been happily married almost 54 years and do almost everything together. They raised three boys and a girl and Marjorie put Allan through college. Today she is semi-retired but still works part time as a teller in a local bank and as Secretary/Treasurer of a recently formed nonprofit and tax exempt foundation located in Moreno Valley, California, called the Self Accountable Children's Society (SACS). It is designed to create self-reliant children at school and home, as depicted in her article published by *BHM.*

Allan, a captain in the Retired Reserves, began teaching elementary school in Moreno Valley Unified School District in 1959, where he innovated the "Harrison System" to instill self-reliance in children that Alice described in her article.

Later, Marjorie and Allan started and operated two different private elementary schools in Santa Ana and San Diego. Presently, Allan is President and Executive Director of the SACS Foundation.

Marjorie coauthored and self-published two book manuals with her husband in 1979 called "Discipline At School Made Easy" and "Discipline At Home Made Simple." With Allan's help she also wrote the article contained in this anthology.

Think of it this way…

By John Silveira

Just how smart is that computer on your desk?

John Silveira

We were in deadline at the office. Things get hectic then. There are long days and even longer nights and a certain amount of tension permeates the office as we rush to prepare the magazine for publication. On top of that, the submissions were a foot-and-a-half deep on my desk and I wouldn't be able to get to them until after this issue went to print. But that didn't stop more from coming in everyday.

Outside, the sun was shining. It was teasing its way through the venetian blinds and I think it was calling my name. Behind me, O.E. MacDougal, the poker-playing friend of Dave Duffy, the publisher of this magazine, was taking his fishing reel apart. He'd arrived the night before and soon would be heading out to the lake.

When Dave walked in the door he looked at Mac. "When'd you get here?"

"Last night. Figured I'd stay here at the office."

"Good. Glad you could make it." He looked at the reel in Mac's hands. "Mac, I wish I had your job."

Mac smiled. "I lost $12,000 down in Reno last weekend."

"Is that a joke?"

Mac shook his head.

"Humph. Guess I'll keep my own job," Dave said and sat down as he flipped the switch to turn on his computer.

"You really lost $12,000?" I asked.

He nodded while he looked inside the disassembled reel.

"I can't believe you're sitting here getting ready to go fishing after losing $12,000. Of course, I can't even believe you play poker for a living."

He shrugged and continued to examine the reel. "I've lost big before. But I always make more than I lose by the end of the year. Besides, I get to go fishing whenever I want."

I shook my head. "There aren't enough fish for me to be able to live with a loss like that. I wouldn't be able to sleep at night."

Dave was staring at his computer. He watched it go through its exercises, one screenful of commands after another that have to be executed before he can use it. "These things take too long to boot up. I need a faster machine." He drummed his fingers on his desk. "Did you guys follow that chess match between the Russian and the computer?"

"Garry Kasparov and the IBM computer they call Deep Blue," Mac said.

"That's right. Did you think Kasparov was going to win as convincingly as he did?"

"Sure," Mac said.

Dave turned to say something but I interrupted, "How was that possible? How could a man beat such a sophisticated computer. I didn't think computers made mistakes."

Mac looked up from his reel.

"Do you guys play chess?"

We both nodded.

"Do you play well?"

"Silveira does."

"I'm just fair," I said. "I'm not really any good."

"In that case, I must be lousy," Dave laughed.

"You are," I said.

Mac smiled. "Well, most people think chess grandmasters play chess the same way they do, only better. But that's not how they play at all. Computers, however, *do* play like you do, only better."

"I'm not following you," I said.

"It would help if you understood the difference between the way you and grandmasters play. At your level of sophistication, you look at a bunch of different moves and hope you'll see a way you can capture some pieces for nothing, and sometimes you even get lucky and find a way to pull off a sneaky checkmate your opponents have overlooked. I'm going to suppose you imagine that grandmasters play the same way, only better. But that's really not the way they play at all. They're too good to just leave pieces hanging out there to be captured for nothing and they don't carelessly fall prey to simple checkmates. Oh, there are some famous games where spectacular blunders have been made—grandmasters are still only human—but, in general, those things don't happen when they play each other."

"Then how do they play?" I asked.

"Instead of just grabbing pieces or instant checkmates, grandmasters look for strategic advantages, just like a good general does on a battlefield. A chessboard has its own terrain, like a battlefield. Getting your power concentrated in the center of the chess-

board is like taking the high ground in a battle. Having freedom to move your pieces is like having good supply lines and mobility in battle. Secure lines of pawns can become incredible defensive positions. There are all kinds of analogies between war and chess, and, just like a good general in war, a good chess player will try to win all the tactical and strategic advantages he can before the big battle is fought.

"But most of the strategic advantages they fight for are so subtle that they're lost on the minds of average players. A grandmaster knows that if he wins these little struggles he can improve his position, even though the rewards won't be realized for 10, 20, or even 30 or more moves. And that's beyond what any player or even the best computers today can see."

"How many things could he possibly look for?" I asked.

"Well, it's been estimated that a grandmaster has about 100,000 rules of thumb stored in his mind."

"100,000?" I asked incredulously.

"Some are obvious like the three I've mentioned. There are a bunch of others like commanding open files, keeping pawn chains intact, centralizing knights. Any of these sound familiar?"

We both shook our heads.

"The ones I mentioned are the kinds of things you learn when you first decide to improve your game beyond the novice stage. But there are thousands of other things a grandmaster has to be aware of and that's what makes them great players."

"I don't know half of what you're talking about." I said.

"And I just look for moves," Dave added.

"And that's what both of you have in common with a computer because that's all a computer does. It has no feel for strategy. With its tremendous calculating powers, all it does is look for moves."

"But how can a computer play against a grandmaster if it plays the same way I do?" I asked.

"You can only look at a few moves at a time, but Deep Blue can calculate 80 to 120 million moves a second. That's more moves in a second than have been played in all the games between grandmasters since the game was first invented."

"Wow," I said.

A human can't look at more than a handful of the possibilities before him. But the computer, with it's incredible move-crunching abilities and lightning speed, can examine millions.

"How does it choose its moves out of all those possibilities?" Dave asked.

"The programmers put a software routine in that evaluates each sequence of moves the computer looks at; low values go to moves that are detrimental to the computer and high values go to moves that benefit it. From the millions of moves examined, the computer picks the move with the highest value."

"How many moves does a grandmaster look at?" I asked.

"Probably no more than either one of you do."

I was stunned. "But how can humans win when they look at so few combinations?"

"A grandmaster doesn't have to look at every combination. For one thing, he knows most are fruitless. For another, it's more profitable to focus on those strategic moves he knows are going to pay off further along in the game in situations than neither he nor the computer can see.

"Someone once defined a good chess player as one who knows what to do when there's something he's got to do, and a great chess player as someone who knows what to do when there's nothing to do. And that's the difference between Kasparov and the machine. The machine always knows what to do when things are obvious, but Kasparov goes beyond that; he knows what to do when there doesn't seem to be anything to do."

"Those little strategic goals," Dave said.

Mac nodded.

"How many moves deep can the computer see?" I asked.

"Within the time limits imposed on it by tournament play, probably no more than a dozen because at that point the number of possibilities exceeds what even the fastest computer can readily calculate."

"So," Dave said thoughtfully, "when a good chess player plays a computer, his best strategy is to play for those little strategic goals the computer isn't programmed to know exist, and to play for advantages further along in the game than the computer can see."

"That's exactly what they do."

"On the other hand," Dave said, "when the computer plays, its best strategy is to try on all the moves for size and see which one works."

"I like the way you put that because that's exactly what the computer does. It's the essential difference between men and computers."

"But the machine also has other advantages," Mac added. "It doesn't get tired, it doesn't make mistakes, it doesn't get upset, and it finds unusual lines of play that would never even occur to a human opponent."

"What do you mean by that last point?" I asked.

"A human can't look at more than a handful of the possibilities before him. There are just too many to consider. But the computer, with its incredible move-crunching abilities and lightning speed, can examine millions. It'll find unusual moves that are good that the grandmaster can't find because he doesn't know how to look for them."

"It'll find the 'needles in the haystack' that grandmasters wouldn't bother to look for," Dave said.

"That's right."

"How good will computers get?" I asked.

"Not only will computers in the future be able to look at even more moves and go deeper into the game, but with the help of good chess players they'll be able to build up a repertoire of good positions that will emulate the strategic rules of thumb the grandmasters use. One day, no human is going to be able to beat a good computer again."

"If a computer can beat a man at a game as complicated as chess," I asked, "is there any game we'll be able to beat them at?"

"Sure. Just change the rules. Instead of an 8 by 8 board, make it a 10 by 10 or 12 by 12 board and add some new pieces that have new kinds of moves. A game like that would suddenly overwhelm the computer—at least until the next generation of computers comes along—by making the number of possible moves it must examine go from the billions to the trillions."

"Why?" I asked.

"A huge increase in the number of possible moves isn't a big handicap to the human player because his play is based on strategy, and the quick formulation of strategies is always within the conceptual grasp of good players, even as the complexity increases.

"To the computer, however, if you increase the number of possible moves by a factor of 100, you increase its workload by a factor of 100."

"You're saying the brute force calculations would become less decisive, but the way we think, by generalizing strategies, would become advantageous."

"That's right."

"Why do you think Kasparov lost the first game?"

"I was surprised," Mac said. "I don't think any grandmaster's ever lost to a computer under tournament conditions before. Maybe a computer will be the world champion before we know it."

Chess and IQ

"Maybe computers will become as smart as we are," Dave said.

Mac gave Dave a funny look. "Actually, there's no correlation between the ability to play chess and intelligence."

Almost simultaneously Dave and I said, "I find that hard to believe."

"There was a Cuban player earlier in this century named Jose Capablanca. Some consider the him greatest player that ever lived. He didn't consider chess a game of intellectual prowess at all. He said it's an art. In fact, some of his contemporaries hated him because he said some of them were actually stupid."

What they found, to their own surprise, is that there is little, if any, correlation between chess ability and I.Q.

"I don't see how you could be stupid and be good at chess," I said.

"In the 1950s, the Russians confirmed his assertion. Chess is a national obsession with them and they conducted extensive tests to identify potential chess prodigies. What they found, to their own surprise, is that there is little, if any, correlation between chess ability and I.Q. Some of the Soviet grandmasters were superb players, but otherwise of ordinary intelligence. However, they did discover that what makes a good chess player is the ability to manipulate objects in your head and to have good long term and short term memories."

"Then that's all the computers have going for them," Dave said.

"And speed."

"And speed," Dave added. "Otherwise, the computer is just an idiot."

Mac nodded. "The machines of science fiction that are conscious and more intelligent than man are just that—science fiction. Deep Blue can only play chess. Put some other kind of software on it, and it can only do that. A human mind can do a whole bunch of things—many of them pretty well and quite a few others better than any computer.

"Before anyone makes a computer that can really compete with humans, something fundamental is going to have to change in the way we manufacture and program them. We're still a long way from making a computer that can duplicate, or even mimic, a human's brain. We can't even make one that duplicates a bee's brain."

"Why are the computer scientists wasting their time and energy on a computer that can just play chess?" I asked. "Why aren't they trying to solve some of the world's big problems?"

"Chess may seem like a waste of money and time, but it's not. By building a computer and devising programs required to play a world champion at chess, they're developing computer architectures, algorithms, and programming techniques that will be used to solve other problems once thought to be beyond the capabilities of humans and computers. Some will be as mundane as scheduling and routing airport traffic. Others will involve problems in economics, chemistry, medicine, and who knows what else."

"Well, why not go right after solutions to those problems?"

"Because those problems aren't as simple as chess. In chess, there are wins, losses, and draws. And even if your computer loses, its performance can be readily evaluated. If a computer can play a decent game of chess, maybe it'll be ready to tackle something tougher. But if it can't even play chess well, what chance does it have with more complex problems?"

"You know what I want?" Dave asked. "I want a machine just like Deep Blue on my desk."

"That power will actually be available to the consumer in the relatively near future."

"Really?" we asked.

"Sure. The chips Deep Blue used are all on the market now. One of the things this chess exercise did was show how the hardware and the soft-

ware developed for it can work together. This kind of power will eventually be in the consumer's hands. It's just a matter of time."

"Well, I want one," Dave said and we all fell quiet for a few minutes. Dave and I started working while Mac reassembled his reel.

"Do you play chess anymore?" I suddenly asked Mac.

"No. I kind of lost interest in it."

"It's not like your game, poker," I said. "There's no chance in chess."

"That's not true," he said.

"You're joking."

Dave stopped working and turned around again. "There's chance in chess?"

"Do you remember the American who was world chess champion, Bobby Fischer?" Mac asked.

"Yes."

"When analyzing games, he often talked about winning chances. What do you think he meant?"

I shrugged.

"Well," Dave said, "it sounds like he meant that since there are billions of possibilities down the line, but no way to see which one's going to come about, that the chance lies in the decisions we make, even though, in theory, we should be able to see them all."

"That's right. In theory, chess is a game of perfect information, like tic-tac-toe."

"What's that mean?" I asked.

"A game of perfect information is one where you can see the result of every move and countermove, like tic-tac-toe. Even a school kid can see how every move in tic-tac-toe has a logical best countermove. In theory, chess is the same way, but…"

He hesitated there for a moment. I think he was expecting a response from us and suddenly Dave said, "But chess is so complicated that future moves get murky. Even a computer, whose forté is that it can look at hundreds of millions of combinations, can still only see so far. Beyond that horizon are unknown positions, and the advantages or disadvantages that are going to befall the players are unforeseeable. The choices we make to get to those futures are the chances we take."

Mac nodded. "It's almost a certainty that one day chess will be a game of perfect information, but only to a computer. It'll never be completely knowable to the human mind."

"Boy, that's a philosophical bone to chew on," Dave said.

"Do you see any downside to computers playing chess so well?" I asked.

"Sure. Just wait because someday, someone's going to cheat in a tournament with one."

"How?"

"Computers are getting so small that someday someone will conceal one on his body and use it to cheat in a chess tournament. It's conceivable that in some local tournaments, it's already been done. How would the tournament officials know?"

I shook my head. "How do you think of these things?" I asked.

He shrugged. "Active imagination?"

Computers and fishing

Dave was still thinking. "You know," he said to Mac, "I think I've learned a lot about computers today. If I had to sum it up, I'd say first that computers don't think like us—in fact, they don't think at all."

Mac nodded.

"Second, they're still nothing more than glorified adding machines. Third, our forté as humans is that we can take information and formulate generalizations and strategies from it instead of having to consider every possibility. Computers can't do that—yet."

Mac nodded again.

"And fourth, a computer doesn't even decide what to think about, or even how it's going to to think about it. We have to tell them how to do these things."

"I'd agree with everything you've said so far," Mac said, "but you're leaving out the most important thing."

Dave and I thought for a few seconds.

When we didn't say anything, Mac said, "They can't fish."

"What?" we asked.

"They can't fish."

I said, "Well, we could rig up some kind of net and one of those fish finders to a computer and they'd do a pretty good job of catching fish…"

"No, John, I'm saying a computer can't fish."

"But with the right electronic equipment attached to it…"

"You're not listening to me, John. You don't have to catch fish to go fishing."

"Oh, I see what you're saying. They can't…won't…" I groped for words.

"That's right, we enjoy life. A computer doesn't."

With that, he stood and gathered up his fishing equipment. "I'll probably be back for lunch. Maybe I can supply it."

He walked out the door. We could hear him get into his car and start warming up his engine.

Dave drummed his fingers on his desk. "You know, we speed up for deadline, we slow down in between."

I looked at him.

"How far behind are we?" he asked.

"Looks...bad," I said.

"Wanna just work like dogs, tonight?"

"Sure."

"Mac," he yelled as he jerked the door open.

Mac wasn't quite out of the driveway when he hit his brakes.

"Wait up," Dave yelled.

Dave grabbed his fishing gear out of his truck and I got mine from the trunk of my car.

"Hitch a computer up to a net and a fish finder," Dave mumbled to me as we jumped into Mac's van. "Where do you get those crazy ideas, John?"

I shrugged as Mac shifted the van into drive and we were off into the sunshine. Δ

Ducks contribute to a homestead in many ways

By Sylvia Gist

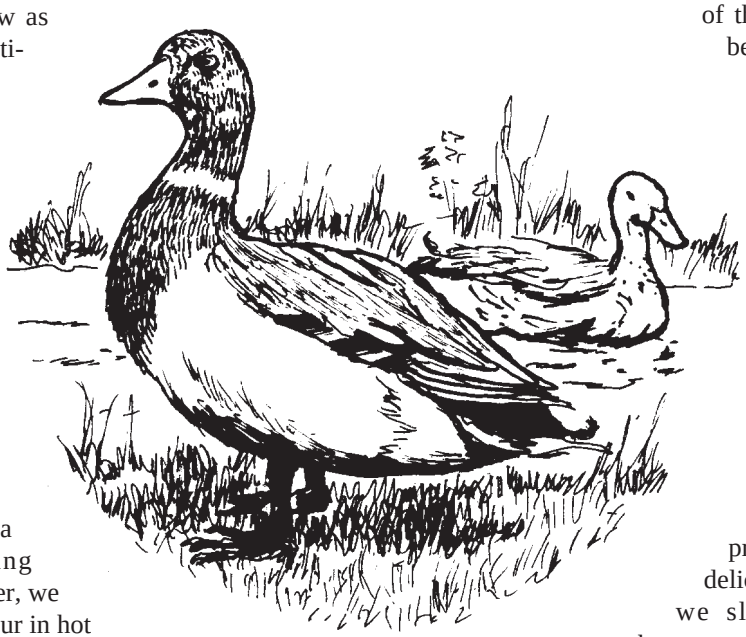
Free ducks! The ad on Tradio was irresistible. (Tradio is our local buy-sell-and-trade radio program.) I had always wanted to have ducks. It had never been a possibility before, but now that we had a place of our own out of town, we had the space and could think about raising them. In the beginning, I just thought they were cute. I learned they were far more.

When we picked them up, we found out they were Rouens, a "general-purpose" duck of fair size which resembles the mallard (only larger) and is sometimes called by that name. Within a few weeks, we chose two hens and one drake to keep over the winter. At that point, I was as yet unaware of the great asset they would become to our budding organic lifestyle and our effort toward self sufficiency.

From the start, their needs were minimal. Rouens will forage for themselves for a part of their feed if given the opportunity, so they do not require great amounts of commercial feed. For shelter, we provided them with a small building, perhaps 4' x 2' x 2' high, which they persistently ignored, sleeping in the open until the first measurable snowfall. At that point, they reluctantly moved inside. To go in the snow, they waddled out and quickly dropped to the ground, pulling their feet up in their feathers. They would flap their wings rapidly and attempt to skim the snow as they headed for their destination.

However, in spring, they thoroughly enjoyed sitting out in the rain. Only windy, blustery days would drive them to shelter. We constructed a makeshift shelter from straw bales to serve as an alcove in which to put their feeder (handmade by my husband from 2x4s). An old dishpan served as a waterer (and swimming pool). In very cold weather, we had to chip the ice and pour in hot water, which provided them very enjoyable swimming. This swimming hole was barely large enough to accommodate them in mating, so as the weather warmed, we provided larger water containers.

In spring, the hens laid eggs in the corner of the little "duck house," which had been abandoned with the warmer weather. This small shelter served the hens as they brooded for the required 28 days and continued to provide a home for the family as the ducklings grew. In just a few days, the little ones were out adventuring under the watchful eye of mama, seeking out the swimming hole, which, for them, happened to be a shallow black rubber feeder we had purchased at the farm store.



Liquid fertilizer

It was this swimming water (and any water they would subsequently be able to throw themselves into) which provided a major contribution to our ecosystem. Ducks "foul" the water, adding a lot of nitrogen, which, if the water is dumped, will go to waste. We were able to make use of this "liquid fertilizer" in the garden, which we were striving to grow organically. I transferred the water to five gallon pails (procured from a fast food restaurant), carried it to the garden, and distributed it by the quart to lettuce, leeks, and other nitrogen-loving plants. Carefully avoiding direct application to leaves, I poured it on the ground at the base of the plant. The result was big, beautiful heads of leaf lettuce, from which I trimmed the outer leaves. I then fed those leaves to the ducks. Since the two hens hatched out 27 ducklings, we had a plentiful supply of nitrogen-rich liquid fertilizer during the summer.

Delicious meat

Not only did this large flock provide a great deal of fertilizer, they went on to provide my family with a lot of delicious, tender meat. Although we slaughtered most of them between the ages of eight and ten weeks, we could have waited longer and

A BHM Writer's Profile: Mark & Lynn Klammer

Mark is by profession a computer technician and, by education, a geologist/chemist--but at heart he will always be a farmer. Lynn and their four children just try to keep up with him.

missed some of the pinfeather problems. For this reason, we ended up skinning many of them. Those which picked fairly clean, we froze for roast duckling. We cut up the skinned ducklings, separating the pieces, and packaged them to meet our needs. I saved all the livers for frying fresh—a real treat served with eggs and toast for breakfast.

There are plenty of recipes for roast duckling and various stuffings, but what does one do with skinned pieces? One recipe I borrowed became a favorite of ours. First dredging the pieces in seasoned flour or biscuit mix, I brown them in duck grease in a cast iron chicken fryer. Next I add chopped onion and some water. Then I turn the heat down, cover, and let them simmer until the meat is fairly tender. In the last 30 minutes, I put in small whole potatoes or chunks and allow everything to simmer until done, adding water as needed. Finally, I remove the meat and potatoes and make gravy.

The grease I use for browning is obtained from the drippings of a roast duckling. It also can be used as a substitute for butter on popcorn.

Eggs

Another source of food is the eggs. The Rouens are an all-purpose breed, which means that they are only average egg layers, as ducks go. My initial intent was to raise baby ducks, so I gathered the eggs only in the early spring when the nights were freezing and the eggs would be damaged. As soon as the weather improved (which happens in April here in western Montana), I left the eggs in the nests. Both hens laid in the same nest until one hen claimed it and began to set. As I watched the eggs pile up (and since neither hen seemed to be broody), I took out a few eggs, trying to keep the total between 12 and 15. These eggs I boiled, mashed, and fed to some new baby chicks we had at the time. The earlier eggs, however, I used for baking, allowing one duck egg for every two chicken eggs.

Down and feathers

Their contributions do not stop here. A by-product of slaughter was the down and feathers. Picking the ducks dry, we plucked the big feathers into one barrel. These feathers would go into the compost pile. We moved to another barrel to deposit the very small feathers and the down. To clean them for later use, I plunged them into a five-gallon bucket of warm water (adding soap if they were really dirty) and swished them a few minutes, transferring them by handfuls to a new bucket of clean water. I then used a pillowcase, turned wrong side out, as a strainer, pouring the water and feathers into it. (Don't put an excessive amount of feathers in one pillowcase, or they'll be so crowded they won't dry and fluff properly.) I squeezed out the excess water, put the wet ball of pillowcase and feathers in a mixing bowl, set it next to my sewing machine, and securely sewed the top shut. To extract more water, I used the spin cycle on my washer for a few minutes. Next, I threw it in the dryer on low for a while and then on "air dry" for a while. They come out soft and fresh-smelling. One just has to rip out the stitching and transfer the feathers to the desired destination.

Simple pleasure

A less tangible by-product of raising ducks is the pleasure I get from watching them. Excitement gripped me as I saw the tiny black and yellow heads peeking out from under the hen. A few days later we praised the hen as we admired her fluffy offspring—black and yellow like bumble bees—running energetically around in the pen, hopping gleefully into an opportune pan of water. A loud squawking from her would bring me running to the pen to see what trouble "Mother" couldn't fix by herself. A warning cry from the duck hen when a hawk flew over would send not only her ducklings to shelter, but also our young chickens and turkeys.

As the babies grew, they ate with the same zest with which they swam. In this energetic fashion, they learned that lettuce (the candy of the duck world) came from humans, and they would beg when I approached. As they grew, they were always optimistic—a delight to watch.

We provide our ducks with water, some feed, and minimal shelter, and they provide us with eggs, meat, feathers and down, fertilizer, and simple pleasure. They are economical, definitely giving more than they take ...all in all, a great addition to our farmstead. Δ

Concrete domes have some impressive advantages

By Lance Bisaccia

In the mountains above Ashland, Oregon, there's a place where you can pull your car off the road and look up and see three linked concrete domes whose sides merge into each other like 20-foot soap bubbles. Their appearance is a little strange and very pleasing. When I interviewed the owner/builder, Steve Wolf, I learned that they have a *lot* more going for them than their looks.

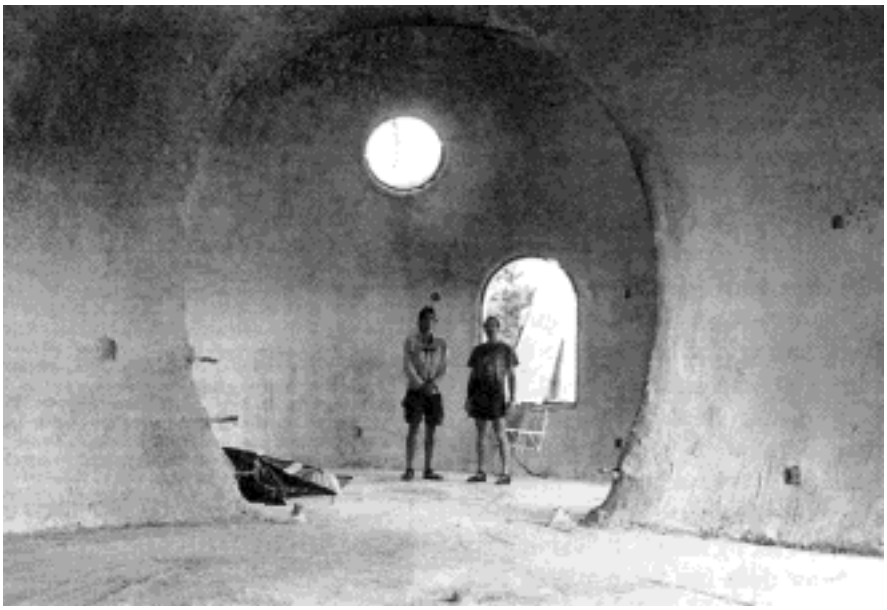
Steve was a builder for ten years, but he got sick of community design reviews and building regs that put inappropriate limitations on builders. He decided to design and build his own place. As he studied various construction technologies, he found himself increasingly impressed by the advantages of concrete domes—advantages that center around their structural integrity. A concrete dome transmits stresses through its structure, which makes it very strong. This kind of structure can last for centuries, in case you'd like to make a house your great-grandchildren can enjoy.

There's a special feeling about being inside a dome, with its soaring spaces, unbroken by internal supports. Steve calls it "inspirational." He points out that a concrete dome is also

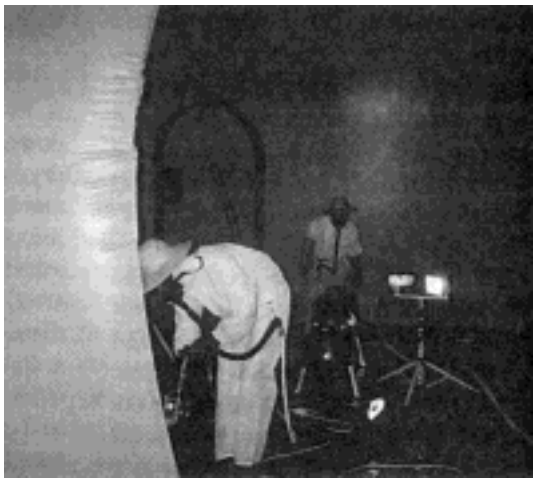
Fireproof: Not only will a fire *outside* the house normally be stopped by the concrete, but a fire *inside* the house probably won't spread to the forest (or in another setting, the neighborhood) around the dome.

Earthquake-proof, compared to conventional construction: It should handle a Richter 7.

Windproof: It has no vertical surfaces or overhangs for the wind to hammer and tear. About 70% of homeowners' insurance claims are wind-related.



The application of shotcrete is complete.



Inside the air form

Steve showed me a photo of a nice-looking residential dome in hurricane country and said the owner just wasn't worried anymore.

Strong enough to berm or bury: You can berm up the side as high as you want, or even bury the entire height of it, and get your building out of the temperature extremes of the surface.

The construction techniques Steve used are fascinating. Some of them were also technically very demanding (the foam) and quite costly (leaving the air form in place). Later on in the article, we'll take a look at some alternatives that most of us would find more manageable and more affordable.

The dome is constructed in a pretty amazing way: the concrete is *shot* from a huge high-pressure hose onto the inner surface of an inflated air form that's as big as the finished dome. Does this mean that you're actually working *inside* a huge balloon? Yes it does.

Here are the steps:

Pour a concrete slab for your foundation, **and anchor to it (1) the air lock, and (2) the air form**, which is made of very strong reinforced vinyl. For Steve's house, the air form is being left permanently in place as a

Framing for door opening. Blue air lock is visible in the background

vapor barrier. After a few years, sunlight would damage the vinyl, so it will be covered. (Part of Steve's domes will be finished with stucco and part will be bermed.) The edge of the slab is a "keyway foundation" from which sprouts the first course of vertical re-bar. Steve used a vibrator on this part to get all the air out of the concrete, for extra strength.

Inflate the air form with a powerful fan, which needs to keep running until the dome-sized grid of re-bar is complete. Vents maintain the correct pressure in the air form. Steve's air form was custom-sewn by a company called Monolithic Constructors in Italy, Texas.

Inside the air form, **place wooden forms to define doors and windows**. You'll create your grid of re-bar around these future openings.

Blow one inch of foam insulation over the entire inner surface of the air form (except your "framed openings"). Steve described this material as a "plural-component urethane foam," and he said that applying it was one of the most challenging parts of the project. The foam is very fussy, and it can't stand any moisture or temperatures under 45°. It's sensitive to ultraviolet, so you don't use it on outside surfaces. It's not your ideal do-it-yourself technology: you'd probably want an experienced worker to apply it, which naturally increases the already considerable cost of the stuff. Fortunately, as I indicated earlier, its use is not essential to making a concrete dome, and we'll take a look at some alternatives later.

Once that first one-inch layer of foam sets up, **install *re-bar hangers*** all over the inner surface. Each of these ingenious hangers combines a staple that you drive into the foam, a flat surface that will be held in place by the *next* layer of foam, and a pair of six-inch wires that you'll twist to bind the re-bar into place. **Apply another two inches of foam**.

The foam has excellent insulation properties, and makes it possible to provide almost all needed heating for Steve's domes via solar gain. The domes' total floor area is 960 square feet, with eighteen-foot ceilings. In December of 1995, up there on the snowy mountainside, it cost him $14 to keep the domes at 60° for the month.

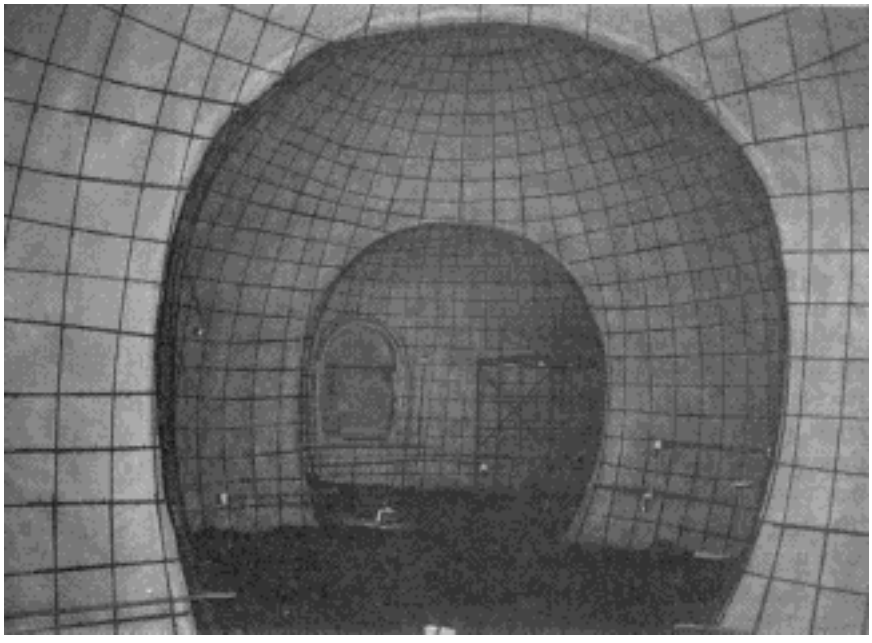
Create a grid of number-three re-bar on ten-inch centers, a grid that covers the entire inner surface of the dome (except the defined openings). Do the horizontals first, then the verticals. When the grid is complete, you can turn off the fan that's been keeping the air form and the foam in shape.

Install your electrical conduit and plumbing pipes, attaching them to the re-bar grid. They'll be inside the concrete.

Now it's time to **shoot the concrete onto the re-bar grid**. You use a special super-high-density type of concrete mix called *shotcrete*. Here is a typical recipe:

- one yard of sand
- seven sacks of concrete
- three ounces per yard of industrial soap (to create small air bubbles)
- Easy-Spread (Bentonite clay) to make the shotcrete flow better
- "cottony" polymer fiber to reduce hairline cracks and increase strength

You spray it on with a special electric shotcrete pump. A 185 cubic-foot/minute compressor adds air at the nozzle. Steve said this was the hardest part of the process. (Once again, an owner/builder might think twice about



The re-bar grid

Rear view of the domes, covered by the air forms

trying to do this himself. We'll consider an alternative below.) You shoot on seven applications of a half-inch each, and at every coat, you trowel and scrape and smooth, using traditional concrete-finishing tools. When it's done and cured, you can finish the interior with plaster.

Inside the dome, you can use conventional stud framing to create interior rooms, a loft, etc.

Steve is planning to berm the back of his domes to a height of 12 feet. One of the virtues of the dome is that it's strong enough to permit this. Similar domes have been buried to a depth of 22 feet.

A different approach

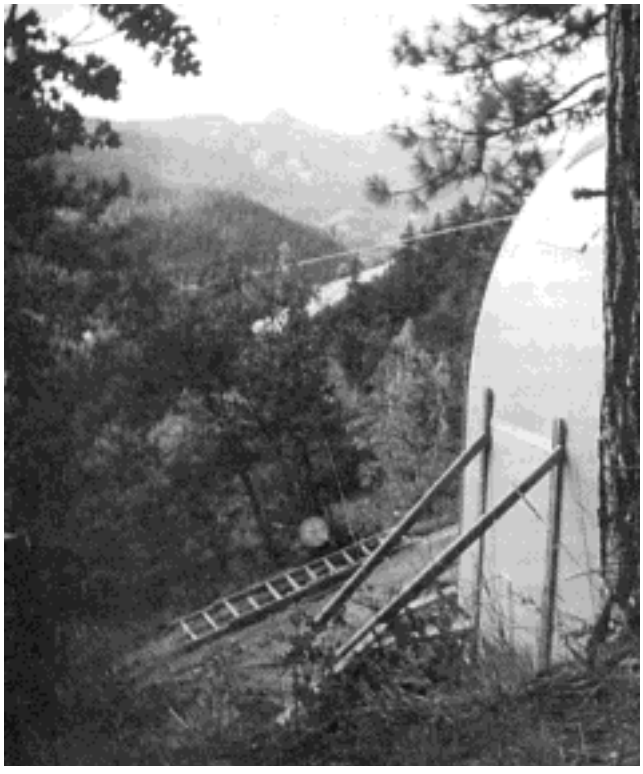
After I spoke with Steve, I looked up a man named Miten Ahern, a contractor who has done concrete dome construction and is preparing to build them in a new and innovative way as part of his business. Miten was one of the first students at the dome-construction trainings offered by Monolithic Constructors (the company that created Steve Wolf's air form).

Miten's new and more affordable approach goes by the name of Eco-Straw Domes. In this technique, the re-bar grid is constructed *outside* the air form, and the shotcrete is applied to the *outside* of the form. This method became possible fairly recently, when a new and stronger fabric came into use for making the air forms. This stronger material can withstand a higher internal pressure, which makes the form more rigid, so it can withstand the high-velocity application of the shotcrete from the outside.

One of the important benefits of this new technique is that the air form can now be removed and re-used many times. What this means to the owner/ builder is that now you can *rent* the form instead of having to buy it. This brings a very substantial reduction in the cost of the house. Renting an air form costs about $1/square foot, plus about $1/square foot for shipping. You can rent both the air form and the inflation fan from Monolithic Constructors.

So: you do your slab and footing (a one-day pour). In this version, you install your electrical conduit and plumbing pipes (and hydronic tubes for heating) in the slab. Attach and inflate your rented air form, and erect your re-bar grid around and over the dome. Making the grid is likely to take two or three days. As with Steve's project, you'll place wooden forms to define your door and window openings and make the grid around them. You can climb on the lower parts of the grid to create the higher parts.

Once your grid is ready, you hire a shotcrete company (they're easy to find) to come in and apply the shotcrete to make a dome four inches thick. Miten says they'll do the job in



The view from the dome

one day. In fact, it's *important* for them to do it in one day, to create a dome that will cure as a unit for structural integrity and strength.

Can you apply the concrete by hand, to save the money for the shotcrete equipment and crew? No, you can't: this style of construction requires the high-velocity application of the shotcrete, in order to be strong.

So far, this method has resulted in a concrete shell that's very strong, but not so good for temperature control. You get your insulation by covering this shell with a layer of straw bales. You then cover the straw with a two-inch-thick outer shell of concrete, which is also reinforced with a re-bar grid, like the inner one. Miten says a "two-string straw bale" has an R-value of 40-45. By comparison, a conventional 3½" layer of fiberglass insulation has an R-value of 11 or 12. You

The living room in a finished dome

stack the bales and "pin" them together with re-bar spikes. On a 40-foot dome, the curves are gentle enough to be no problem to this process.

Straw must be kept dry so it won't rot. Concrete is not a good moisture barrier, so you spray or roll on a water barrier on the outside of the inner dome (about a day's work). Poly-butyl rubber is a likely candidate for this. When the outer shell is finished, you treat that one as well. This waterproofing must be fail-safe, so the straw stays dry and continues to provide insulation. In addition, the straw space is vented, and the straw is "grooved" to accept perforated poly pipe. Any moisture that might find its way into the straw migrates to the perforated pipe by capillary action and is then conducted out of the straw space via the vents.

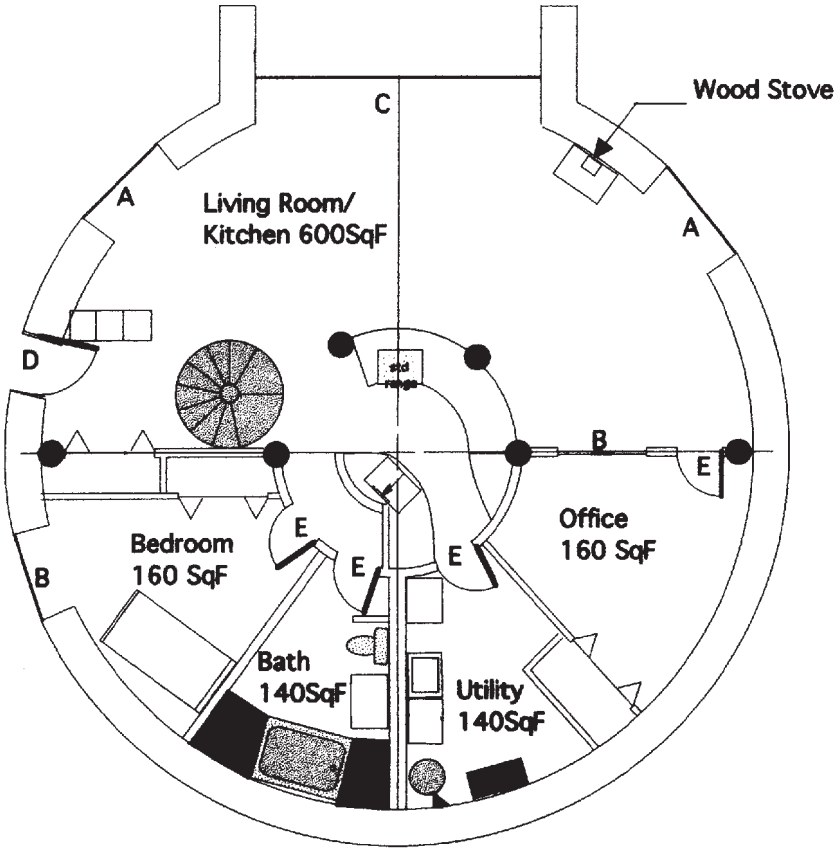
Miten says the cost of a dome like this is very competitive with conventional construction, but the building is far superior. He's planning a 40-foot dome for his own residence. That's big enough for a two- or three-bedroom home with two levels inside the inner shell.

With so much thermal mass in the concrete (to store and release heat), and so much insulation value in the straw, heating and cooling are no problem. Miten's dome will have a large glass area on the south with an overhang designed to *admit winter sun*, but *shade out summer sun*. He'll berm the north side. The air circulates very freely in a dome, so you don't get temperature stratification. And the concrete conducts heat, so if there is a hot spot (near a heat stove or sun space, for example), the heat is conducted away from it, and the inside temperature evens out.

Miten suggests that this type of construction also represents a livelihood opportunity, and he says that getting the training and certification from Monolithic Constructors is an excellent way to pursue it.

Speaking of Monolithic, their own dome office buildings provided dramatic proof of their virtues when they took a direct hit from a tornado. They suffered no damage, while the buildings around them were damaged or destroyed.

For more information about Eco Straw Domes, you can contact Miten Ahern at PO Box 608, Ashland, OR 97520, or send e-mail to miten @aol.com. Δ



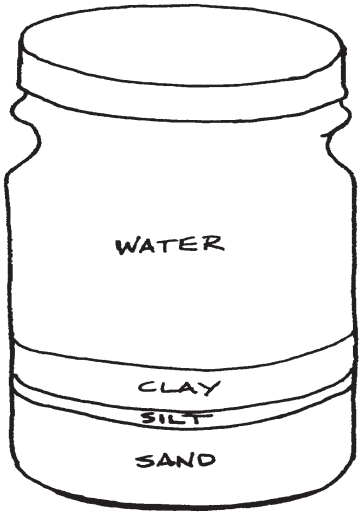
Floorplan for the downstairs rooms in a 40' residential dome

Cob construction is *literally* dirt cheap

By Marna Meagaen

Even as a backwoods woman, I never thought I'd be able to gather the skills to build a house of my own without some technical training, computations and measurements, massive power tools, and some expert advice. It was a delight to discover last summer while helping build Indigo Art Studio in Southern Oregon that I had learned practically everything I needed to know to create a house back when I was a little girl making mud pies in the backyard with my sisters.

Cob, meaning "small lump or mass" in older English, is an ancient earth building technique that is found—with many variations—all over the world. By mixing dirt with sand, water, and straw on old tarps, then moving and shaping it with many hands, it's possible to build houses, galleries, and outbuildings with the very land on which you stand. The walls feel rock-solid when the mix is dry. The sand makes it strong, the clay holds it together, and the straw helps it to breathe, as well as functioning as re-bar. It is remarkably resistant to water, although the foundation is usually brought to six inches above the ground, and the roof overhangs are usually large to minimize splash-back to the walls. Even without these protections, rain splash has only resulted in slight dents at the splashline in 400 year old cob houses in England.



The jar test will tell you what your soil needs to make a good cob mix.

A finished cob interior: the kitchen

A good mix: Basic wall construction

Building with cob brings memories of childhood. You mix approximately equal parts of earth and sand on a tarp by pulling the edges of the tarp towards the center to roll the ingredients around. At the Indigo project, the recipe was ten shovels full of dirt to seven of sand. (See below for determining the recipe for *your* land.) Then you gradually add water from a garden hose and mix the concoction with your feet for five or ten minutes, until the mixture is evenly moist and sticky. At that point, you add a handful of straw now and then (no more than a flake), continuing to roll the mix with the tarp and kneading it in with your feet. You end up with a big "cob pancake." The mixture's consistency is slightly more crumbly than modeling clay. It is added a chunk at a time onto the foundation (usually built of stone, although cement may also be used) and worked into the previous layer of the wall with thumbs, sticks, palms, and feet.

Testing your soil to find the right recipe

The exact ratio of sand added to the dirt will vary depending on each site's inherent mix of clay, silt, and sand. To figure out the right recipe for your land, put a sample of your subsoil—one trowel full—in a one-quart jar. Fill the jar with water and shake it briskly, then set it aside. Sand will set-

tle to the bottom, topped with silt and then clay.

For your cob mix, you want to have 50-80% sand. If that is what it turns out to be in your jar test, you probably don't need to add any sand to the cob mix—just use the soil and the straw. If you have to add a trowel full of sand to get the right percentage, then use one shovel of sand for every shovel of dirt. (In few cases will you need to add more clay.)

Run a few test batches of cob mix with that ratio of dirt to sand. Do other tests with more or less sand, and varying amounts of straw. Build some blocks, let them dry thoroughly, knock them over, hit them with a hammer, and use the mix that results in the strongest block.

Cob does not have to be built with topsoil. When levelling the site for the house, set the topsoil aside for your garden.

For the 240 square-foot structure at Indigo, we used 15 truckloads of sand in the bed of our 3/4 ton pickup. They cost $7 each from the local gravel yard. Ask for "concrete sand," a medium-faceted sand with varying grains. *The rounded sand found on beaches is not suitable for cob construction.*

Make the walls 15 inches wide at the foundation for a one-story structure, 20 inches wide for two stories. As the walls rise, the inside wall should remain *plumb* (vertical), and the outside wall should angle inward slightly at the rate of two inches for every three feet. This slight incline increases the overall strength of the wall. We used a three-foot carpenter's level with a styrofoam angle taped to it to keep our walls straight and angled as needed.

Cob is different from stud frame construction: it doesn't require the constant checking to be sure that everything is level. While you want to be sure to check the walls as you go, the finish work you'll do with machete and plaster helps smooth over your "learning experiences." Because the walls are self supporting, leveling becomes much less crucial.

It is hard to describe the process of applying the cob. It is a cross between kneading a loaf of bread and sculpting a house out of clay. Some people have described it as "massaging" the cob. Basically, you are working with a moist clay/straw slab and mixing it into the previous layer of cob by pushing firmly with your thumbs, by walking on it, or by pushing a stick into it with a slight twisting motion. Don't pound or slap the cob, because that would interfere with the setting up of its structure. Work it gently but firmly. Smooth and shape the walls as they rise.

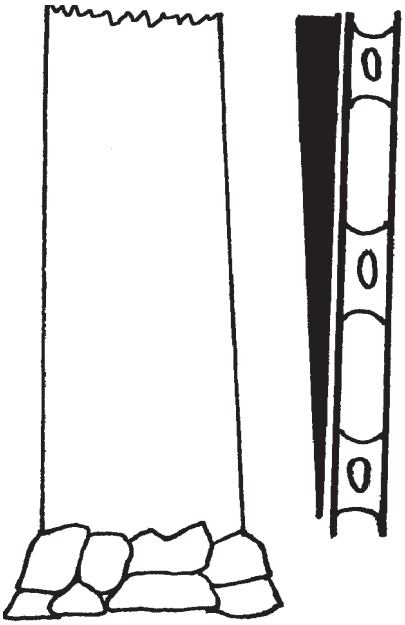
All the tools you need for cob construction

Supports for this scaffolding are built into the wall. When the project is finished, they'll simply be sawed off.

It is best to add no more than a foot of fresh cob per day to your structure, as it cannot maintain its shape without drying some overnight. Too much cob (or too wet a mix) will cause it to "oog out," and you will need to hack it back into shape with a machete.

As the walls grow, the opportunities for sculpting expand, allowing hands to follow the guidance of heart and "error" as well as that of the mind. Cob is a wonderfully forgiving medium. I have seen one incredible cob sculpture of a panther, lying across the top of a window with its tail hanging down the side. It's quite a sight.

To "put cob walls to bed" at night, take a stick that is about an inch in diameter and poke holes two inches deep all over the top layer, four to six inches apart. These holes will help you work the next layer of fresh cob into the drier previous layer. Then



Inner walls are kept plumb; outer walls slant in a bit. It's handy to have a carpenter's level with a taped-on "slant gauge."

cover the walls with several inches of straw and wet the straw lightly with a garden hose. If you expect rain overnight, cover the walls with a tarp.

You should have a design in mind before you build. Know where your door is, where you want your windows and shelves to be. These items are added in as you build, and you have some flexibility to shift windows, shelves and niches around as you go. In order to incorporate doors and windows into cob, drive bent, rusty nails into the sides of the wooden door- or window-frame that will be touching the cob. Position the frame using a level, and then cob up to the wood. The nails will grab the cob and hold tight for generations. This "porcupine" framing technique is detailed in the January/February 1996 issue of *Backwoods Home* (Issue No. 37). It is in the article by Harry G. Nemec, "Here's a cold storage house as good as our ancestors built."

When you install framed windows and doors using the porcupine method, you will need a longer slab of wood called a *lintel* sitting on top of the frame and extending beyond the frame in order to support the weight of the rest of the cob wall above the frame until the wall dries. For the Indigo project, we used cast-off 4x8s and railroad ties as lintels.

Windows that don't open can be incorporated by cobbing around a pane of glass—even a chipped or broken one. At the top, sculpt the cob into an arch—an extremely strong design—and the arch will easily support the weight of any cob above it.

As the walls rise, you can build the scaffolding for working on the higher levels of the wall right into the cob. When you're done, you can saw it off.

Plumbing and electric wiring can be run through PVC pipe through either the wall or the foundation. It's easier to cob around the PVC pipe low in a wall, rather than trying to build a sturdy, immobile rock foundation around a round piece of plastic. A small bush can be planted outside to cover the entryway of the wires or pipes to the house if you decide to plumb or wire through the wall.

Heating and cooling

As a building material, cob provides excellent thermal mass. The ten- to sixteen-inch-thick earth walls lend themselves easily to passive solar designs. Having a south-facing wall that is mostly glass windows with deciduous trees in front helps keep out summer sun and let in winter rays. In summer, the walls hold the night's coolness through the day's heat. Then they slowly radiate the stored heat of the day throughout the cool evening.

Another exciting possibility to try is a hybrid structure with a straw-bale north wall (making use of straw bales' insulative properties) and cob for the other walls. Cob and straw bale walls can be joined by driving wood stakes or branches into the straw bales and then building the cob up around and over those pieces of wood. One central Oregon cob house uses only half a cord of wood for its annual heating needs.

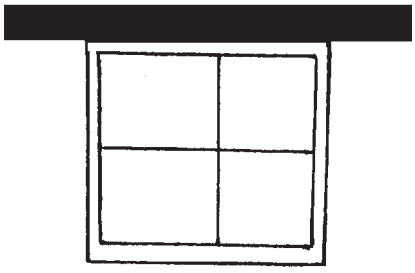
Cob is not a local phenomenon. Many traditional peoples have used earth architecture as their primary housing for as long into the past as memory holds.

Dirt cheap

Cob works well in situations where there are many willing and variously able bodies and few bucks. One of the first Oregon cob houses—one story with a loft and second-story study—cost only $500 for materials. Landfill and construction cast-offs can be scrounged and transformed into perfect cob house materials. At the Indigo project, a piece of wood from in front of the local laundromat became the lintel beam on top of the southern window wall. Rocks, broken or uneven pieces of glass, old teapots, broken plates, bottles, old 2x4's, rusty nails, and beautiful branches gifted from the forest floor can all become part of the structure.

Major costs can include paying for the levelling of the site (if done by rented machine or hired backhoe), purchasing and hauling sand and straw, water or electricity if pumping is required, and roofing materials.

It's best to buy the straw in season—after the spring cutting or fall harvest when availability is high and prices are low. Here in Oregon it costs $2.40 a bale in season, and more than $3 a bale out of season. The Indigo studio used about ten bales, and it was handy to have another bunch lying



A lintel over a framed opening supports the weight of the wall above.

Nearing the top of the wall

around for makeshift scaffolding when the walls began to rise.

Applying plaster

One of the events that stands out in my mind as icing on the cake (almost literally) is combining and applying plaster to the inside and outside of the cob structure. My favorite plaster mix consists of one part clay, one part sifted dirt, one part well-aged horse manure, and some water. The horse manure is handy because the horses have pre-shredded the straw into just the right size for helping make the plaster bind. (There are many recipes for plaster. That will have to be a separate article.)

It's fun to find and gather different colored clays from various locations. Some of that heavy clay soil in your neighbor's yard could be a beautiful addition to your earthen house wall. You can also use lime to lighten the color of the plaster. If you do, be sure to *handle the lime carefully* (washing hands and tools right after application), as *it can be caustic to the skin.*

Now for the special fun. Mash the ingredients together, stand back from the wall, and apply by *throwing* the plaster at the wall. This allows for even coats. For those of more moderate energies, a plaster trowel works just as well.

Cob does not need to be plastered in order to be preserved, but many people choose to plaster at least the inside of the structure to increase the light-reflectivity of the walls. Usually two or three coats are applied, in order to achieve a really smooth finish. Small pieces of tile, ceramic shards, or pieces of glass bottle can be inlaid in the final layer, and patterns or artwork can be etched into or raised from the surface of the plaster.

Tools

Shovels, a pickaxe, and a wheelbarrow help move soil to the mixing areas and onto the tarps. Old shower curtains, large pieces of plastic, and tarps are the mixing bowl for the dirt, sand, and straw that become cob. Hoses and a ready water supply are useful. Used shampoo bottles filled with water (to squirt water to wet down the top of the mix), pointed sticks that fit well to the hand (to massage in the new layer of cob), and more straw and tarps to cover the cob so that it stays moist are also handy. One tool that comes in handy is the modified three- or four-foot-long carpenter's level I mentioned earlier. A machete is useful for hacking off bits of straw that stick out from dried walls. (This helps prepare the walls for plastering.) Various buckets, string, and a cement trowel are also put to work. These, along with willing hands and feet, are all that's needed to put up the walls of a cob house.

Of course your cob home will need a roof, the supporting beams of which can be incorporated into the cob walls. The roof can be anything from a simple standard shed or peaked roof to a recycled tire roof or living sod roof. The choice is yours. Cob itself is too heavy to use for a roofing material.

You might want to practice with cob before building a whole house. There are many smaller projects that are well suited to cob construction. Get your hands in the mud building a cob gazebo or garden bench or wall. These can be fun weekend projects with children, and will give you an idea of the beauty and pleasure of building with cob, as well as the amount of effort and materials you will need.

As Indigo Art Studio grew, we were mesmerized by the stunning beauty of the gently curving structure. The

A finished cob cottage

thought of returning to four square walls became unimaginable.

Both in terms of the medium—mud—and in the fact of working with other people, cob earthen construction is a lot like making mud pies. With few tools, little money, lots of friends, and free reign for creativity, the resurgence of cob construction makes an ancient building technique accessible for backwoods construction, dirt cheap.

For more information about cob, including a schedule of workshops, you can contact the folks that I learned from at Groundworks Earth House Building, PO Box 381, Murphy, OR 97533. They also have a handbook on cob coming out this summer. And you may want to visit my Web site about cob construction at http://www.teleport.com/~sparking/cob/door.html.

An outline of the steps

Select site

Design house

Foundation, floor levels, door placement, and water/ electrical pipe locations are essential.
Incorporate passive solar design.

Gather materials & tools

Materials: dirt, sand, straw, rocks for foundation, water, pipes for electrical/water, cement

Tools: wheelbarrow, tarps, shovels, water hose, hammer, rake, broom, sieve, etc.

Level site

Foundation

Create drainage (this can also be done after the building is complete)
Dig to solid ground, below frost level
Tamp under foundation
Plan under-floor cooler (optional)
Lay pipes for water & electricity
Lay water drainpipe at angle sloping out just above foundation, draining towards downhill side of home
Lay first layer of rock
Add mortar & pebbles
Continue adding rocks & mortar to 6" above ground level
Top foundation with pine tar or other water barrier (optional)

Door frame

Establish door threshold (must be flat) and seat for door frame
Set up and brace door frame with protruding nails to anchor in cob

The first two feet

Start laying cob
Experiment with mixes
Make walls curved & thicker for heavy support areas
Extra sand for heat retention, extra straw for insulation
Incorporate wood for
- Bench support logs or poles (inside & out)
- Lower ladder rungs
- Angled supports for counter
- Door for firewood (optional)
- Outside wood supports for wood shelter (optional)

Start cantilevers for cob benches (seat height usually 14")
Fire vents: incorporate into cob or foundation for fire to get fresh air

Windows

Start windows very low on north wall (or use a pipe with door & screen) to suck in cool north air in summer
Begin solar south window sills

Bury board support for shelves going from floor to ceiling

Stove/Fireplace

Incorporate stove and/or fireplace into wall; bury stovepipe in wall

Sculpt any relief art as you build (optional)

Two to four feet

Start windows
Bury shelf supports or create cantilevers for cob shelves, including under kitchen counter
Leave ledges to support counters
Create wall fridge above counter
Incorporate branches or other supports into cob for future expansion (all the way up)

Four feet and above

Incorporate wood into walls for:
- hanging artwork, branch for pot racks, closet racks, hat & coat hooks
- Lintels & arches over windows

Vent
Openable vent high on south wall
More niches for candles, etc. (outside near the door, too)
Ledges & support beam for loft support

Roof preparation

Supports for roof over door (if not done by roof overhang)
Bury deadmen for rafters (Deadmen are pieces of wood buried in the cob to which you can nail or wire other structural pieces)
Bury outer rafter supports
Bury rafters—plan for fascia & gutters & skylights (Use safety glass)
Insulation—lots of it
Holes for ventilation between rafters

Roof

Gutters
Stove pipe flashing & chimney

Floor

Level floor area (two different levels is appealing)
Create cold drop-off (one foot, no tamping, cover with small stones) for use for cool storage or wood (optional)
Tamp
Level guide nails
Sandy mix, chopped straw, two to three layers, dry in between applications
Score crack lines, fill with different colored mix
Varnish

Finishing

Plaster—porous paint or lime wash
Tiles above counters to protect walls (attach with plaster or white glue)
Lid with ventilation for floor cold spot

Landscaping

Hang door

Wood shelves, benches, counters, doors, lids, tiles. etc. Δ

Make quick and easy pasta

By Jennifer Stein Barker

One of the most simple, satisfying, quick and easy meals you can make is a meal of pasta with a salad. Whole-grain pastas have long had a bad reputation for being coarse and gummy; but this is no longer deserved, as pasta makers now search out higher quality grains and better techniques to formulate the products.

Look for whole wheat pastas made of 100% durum wheat, a hard wheat that is high in gluten. Our two favorite (and readily available in most health-food stores) pastas are Westbrae Organic Whole-wheat Ribbons and Vita-Spelt Shells. Products made of spelt grain are not only for the wheat-sensitive folks. They have a wonderful nutty flavor and great texture that everyone can appreciate.

General pasta cooking instructions

Bring a large kettle of water to a rolling boil before adding the pasta. Use at least one gallon of water for each pound of dried pasta you plan to cook. Some people like to add a little salt and/or olive oil to the cooking water to improve the flavor and keep the pasta from sticking together.

When you add the pasta, take a fork and give it a quick stir to separate the strands. This insures that it will cook evenly and not stick together. You don't need to stir it again; in fact, if you do, it will release more starch and cause your pasta to be gummy instead of firm.

Leave the pot uncovered. Bring rapidly back to the boil, then turn the heat down to maintain a gentle bubbling. Cook as long as indicated on the package; or, if you have no instructions, try 10 minutes as your starting point for whole-grain pastas. Adjust cooking time for doneness as you like it (usually between 10 and 15 minutes).

When pasta taste-tests done, drain immediately and thoroughly in a colander. If you want to pre-cook pasta for later use, try this trick: cook the pasta just under done, then drain and chill. When you are ready to serve, pour boiling water over the pasta, bring the pot quickly to a boil again, then drain. Voila! Dinner!

Confetti spaghetti

Use spaghetti, noodles, or shells for the pasta, just as long as it is whole grain. Choose hearty greens such as bok choy or savoy cabbage. Serves 4:

12 oz. dry pasta, cooked according to instructions
4 cloves garlic, minced or pressed
1 Tbsp. olive oil
1 cup grated yellow turnip
1 cup grated carrot
1 small hot pepper, finely sliced
2 cups shredded greens
2 Tbsp. tamari (or to taste)

Bring a large kettle of water to boil for the pasta.

In a deep saucepan over medium heat, warm the garlic, olive oil, grated turnip and grated carrot. Add 1/4 cup of water and 1 tablespoon of the tamari and cook, covered, for 10 minutes or until the vegetables are tender. (Start the pasta cooking in the boiling water during this time.) Add the hot pepper and the shredded cabbage, and more water if necessary, and cook another 5 minutes. Keep warm. When the pasta is done, drain it and return it to its kettle. Add the vegetables and the other tablespoon of tamari. Toss all together.

Serve hot, with grated Parmesan cheese.

Easy macaroni and cheese

This is a classic. My recipe gives the quick-and-easy version, as well as a more elegant baked casserole that will stand up for company. Our favorite pasta for this is Vita-Spelt Shells. Serves 4:

Sauce:

3 Tbsp. olive oil
3 cloves garlic, minced
1/2 cup fine whole wheat flour
3 cups milk, heated
1 Tbsp. prepared mustard
1 1/2 cups grated sharp cheddar cheese
1 tsp. tamari or Worcestershire sauce
3 Tbsp. sunflower seeds (opt.)
12 oz. pasta, shells or macaroni
optional additions: 2 branches broccoli
1/4 cup breadcrumbs
1 Tbsp. Parmesan cheese
1 tsp. basil

Warm the olive oil and garlic over lowest heat for five minutes to blend the flavors. Whisk in the flour and continue cooking over low for another minute. Then whisk in the hot milk.

Turn the heat to medium and cook, whisking constantly, until the sauce begins to thicken. Turn the heat back to low-

est setting, and let cook, whisking frequently, for 10 minutes. Whisk in the mustard, cheddar, and tamari or Worcestershire sauce. Stir in the sunflower seeds.

While the sauce is cooking, you should be boiling the pasta. When the sauce is done and the pasta drained, you can just stir them together and serve immediately, or you can proceed with the more elegant version:

The elegant version:

Cut the broccoli branches into florets. Peel and dice the stems. Steam the broccoli just until it turns bright green. Stir it into the pasta and sauce, and turn the whole thing into an appropriately-sized casserole. Stir together the breadcrumbs, Parmesan, and basil, and spread openly over the top of the macaroni and cheese. Bake in a preheated 350 degree oven for 20-30 minutes, until bubbling and golden.

Either way, serve with a big green salad and your best smile.

Mama Gianna's easy vegie lasagna

This is a one-dish lasagna with nothing precooked. It makes a great sun-oven casserole, too. Make this lasagna in a two liter or larger casserole. If you do not have a covered casserole, you must use foil to cover the pan, because the noodles need the steam to cook. This is great with whole wheat lasagna noodles. Serves 3-4:

Sauce:
1-28 oz. can ground tomatoes
1/2 cup water
1 Tbsp. red wine
3 cloves garlic, minced
1 tsp. oregano
1/2 tsp. basil
1/4 tsp. fennel seed, crushed
1 Tbsp. tamari
Vegies:
1 medium carrot, grated
1 green pepper, diced
1/2 cup diced onion
Cheese:
1 cup ricotta
1/4 cup Parmesan
1 egg, beaten
freshly-grated black pepper to taste
Noodles:
8-10 lasagna noodles, enough to make 2 complete layers
Topping:
grated mozzarella for topping (optional)

Preheat the oven to 350 degrees, and get out a 2-liter or larger casserole.

In a medium bowl, mix together the sauce ingredients. In another medium bowl, toss together the prepared vegetables. In a small bowl, stir together the ricotta, Parmesan, egg, and pepper.

Layer as follows in the casserole:

- 1/3 of the sauce
- a layer of uncooked noodles
- all the vegetables
- 1/3 of the sauce
- all of the ricotta mixture
- a layer of uncooked noodles
- 1/3 of the sauce

Cover the casserole with a lid or foil (this is necessary to keep the steam in with the noodles), and bake until the sauce has been bubbling vigorously for 1/2 hour. It should take about 1 1/2 hours total.

When the noodles are cooked, the lid can be removed and a layer of grated mozzarella may be added to the top of the lasagna. Bake 15-20 minutes more, uncovered, until the cheese bubbles and browns. In a sun oven, I merely kept this baking until it had bubbled vigorously for 1/2 hour (it took hours to bring it to the boil, but once things are boiling the cooking time is the same in a sun oven as in a conventional one). I removed the lid and added the layer of mozzarella to the top. It was delicious, but in order to be enough for four people we really needed the sourdough French bread, salad, and dessert we had with it. Δ

A BHM Writer's Profile: Mary Jo Bratton

Mary Jo Bratton and her family live in Lincoln, Nebraska. Their school project for 1991-92 was converting a barn into a house where they reside to this day. After being taught at home most of their lives, her children, Danny and Anna, are enrolled in college and are succeeding beyond their mother's wildest expectations.

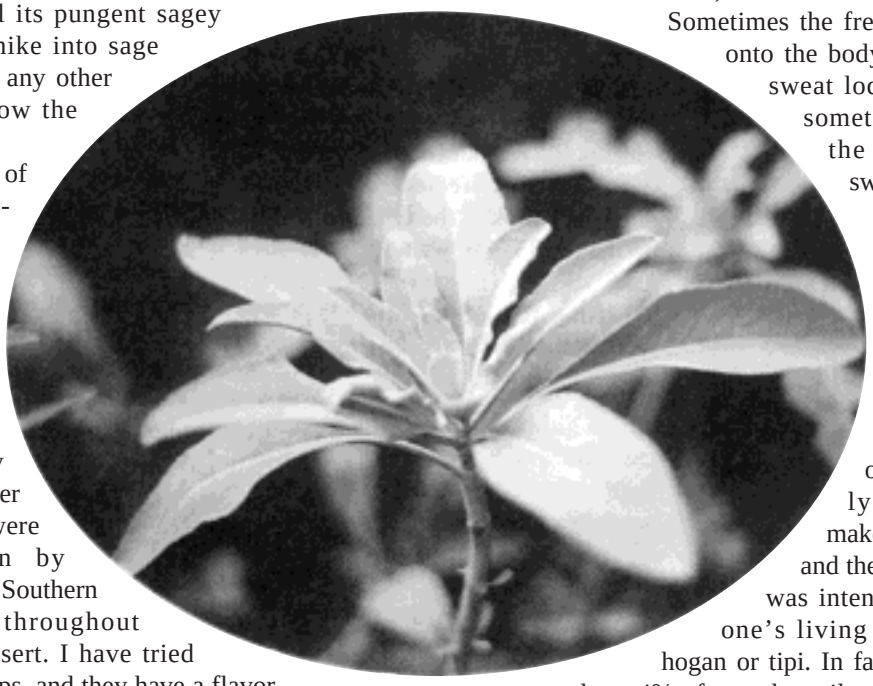
Mary Jo writes for the local newspaper now. In hindsight, she wishes she's added two more tips (tips 11. And 12.) to her article on homeschooling: 11. Put away your television and skip most commercially successful movies if you want to raise creative, energetic, and mentally healthy children; and, 12. Cultivate a sense of humor. It is every bit as important as learning the times table.

White sage — the quintessential chaparral herb

By Christopher Nyerges

White sage (*Salvia apiana*) is a close relative of garden sage, and is one of the more common shrubs of the Southwest, growing throughout the mountains and chaparral areas and reaching to the desert. It grows from three to six feet tall, with its conspicuous whitish-gray leaves.

The plant is easy to recognize in the chaparral areas where it grows. Nothing else has quite that shade of whiteness. And if you're not certain by looking, you can crush one of the whitish-grey leaves in your hand and feel its stickiness and smell its pungent sagey aroma. Many who hike into sage areas may not know any other plants, but they know the white sage.



Some Indian tribes of the Southwest gathered, ground, and utilized the white sage seeds for a flour-like pinole which was used for bread products. The seeds resemble chia seeds, to which they are related. The tender tops of white sage were cooked and eaten by Indians who lived in Southern Nevada and throughout California's high desert. I have tried eating these tender tops, and they have a flavor and texture similar to cabbage, although the sage flavor is overpowering. If you want to eat these tops, I suggest you mix them with other vegetables or meats, or add them to soup.

The fresh or dried leaves infused in boiling water make a good-tasting tea. I've used it for years as my main dinner beverage. With just a bit of honey, it is very satisfying. Drinking sage tea is said to calm and strengthen the nerves. The tea has long been used as an aid to digestion after meals, and also has the reputation of relieving headaches. Sage tastes good and freshens the breath.

Because the fresh leaves can be applied directly as a poultice to stop bleeding and to soothe insect bites, it is a valuable herb to carry while hiking.

In her book, Indian Herbology of North America, Alma Hutchens writes, "The decoction (of sage) is used to cleanse old ulcers and wounds, and massaged into the scalp if troubled with dandruff, falling hair, or loss of hair if the papilla (root) is dormant and not destroyed." Fresh or dried leaves create a pleasant aroma when added to bath water.

I have routinely added dried and powdered white sage leaves into my various smoking mixes. Sometimes I use tobacco, sometimes not. But the white sage adds a pleasant menthol-like flavor.

Sage, regarded as a sacred herb among many Native Americans, is often used in ceremonies. Sometimes the fresh leaves are rubbed onto the body before entering the sweat lodge. Leaves are also sometimes sprinkled over the hot rocks inside a sweat lodge.

The fresh stems are also routinely bundled, allowed to dry, and then lit with a flame. This sage bundle—referred to as a *smudge*—will smolder like incense or a punk, but generally will not flame. It makes a pleasant incense, and the traditional smudging was intended to repel bugs in one's living quarters, such as a hogan or tipi. In fact, the leaves contain about 4% of camphor oil and eucalyptol, both of which have a history of use as insect repellents. Today, the idea of "smudging" has taken on a "New Age" meaning of "repelling evil spirits," somewhat akin to the use of incense during a high mass in the Catholic church.

Some folklore lends sage some mysterious overtones. One curiosity is the fact that wise men have long been called "sage." Another stems from the Latin and Spanish root words for sage being "salvia," meaning "to save."

The useful leaves of this evergreen shrub can be gathered year-round. However, the best leaves are those gathered from the stalks which haven't yet flowered, which is generally winter through mid-spring.

(Christopher Nyerges is the author of Guide to Wild Foods. For a free newsletter, which includes his schedule of wild foods outings, contact School of Self-Reliance, Box 41834, Eagle Rock, CA 90041.) Δ

Safe, delicious, and inexpensive home preserves

By Richard Blunt

Mankind has always been preoccupied with preserving his food, and long before recorded history he developed a variety of effective preservation methods. One of the earliest was the discovery that fruits and vegetables would keep longer if protected from moisture, air, and light. This protection was provided by coating fruits and vegetables with an impermeable substance such as clay or honey. Later, ashes or salt were used as coatings. This also removed moisture from the food and modified its appearance and flavor.

In areas where fire was still an uncontrolled mystery, or where salt was in short supply, simple drying was used to keep food from decomposing. As people learned to use fire, smoke and heat were used to cook as well as to preserve food. Smoke was also combined with other preserving methods, such as salting and brining, to produce various preserved meats and fish that still are popular today. Cured, smoked ham is a classic example of how this ancient technology has survived the test of time.

Another important discovery was that controlled fermentation could produce alcohol-based drinks from fruits, vegetables, and grains that would not spoil. Another type of fermentation was found to produce a potable acid-based liquid—vinegar. Both alcohol and vinegar could be used as food preservatives.

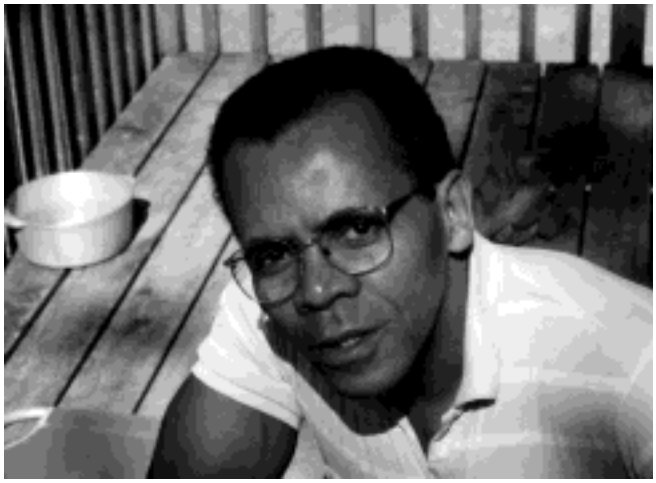
We think of freezing and freeze drying as types of preservation invented by modern man, but pre-Columbian Indians in the Peruvian Andes used Mother Nature's freezing mountain winds to freeze-dry potatoes and other vegetables long before anyone else figured out how to build a freezer.

Fruit, sugar, heat, and sterilization

Sugaring is another ancient technique that is still used to make fruits resistant to spoilage. Prepared fruit is cooked with sugar or honey and a small amount of acid, usually from citrus. This process removes most of the water from the fruit and replaces it with the sugar-acid solution.

In the 16th century, the Spanish began growing sugar cane in the West Indies on a large scale. Sugar became more common, and jams, jellies, and other sweet confections—once made only with honey, which was an expensive ingredient not affordable to most—became available to everyone. This marriage of fruit, sugar, and heat signaled the quiet, yet genuine, beginning of modern food preservation.

Unlocking the secret of preservation by sterilization was in its own way an invention as important as the discovery of fire, and it is the only preservation technique invented by modern man. Sterilization was the method destined to be the basis for the bulk of all preserved food available on the planet today. Credit for this discovery in preserving goes to two Frenchmen, an English tinsmith, and an American.



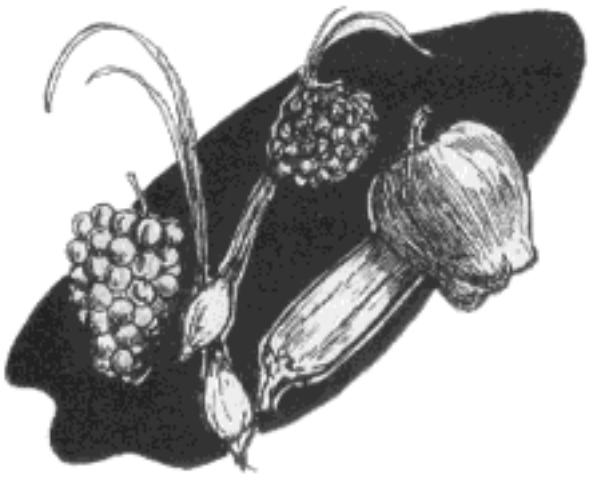
Richard Blunt

In 1795, Napoleon Bonaparte was leading the French army to a series of stunning military victories in Italy. But his army suffered more losses from food poisoning and hunger than from enemy artillery. Spoiled food and starvation had been the scourges of armies since the dawn of time. So, in an attempt to solve this age-old problem, Napoleon offered a reward of 12,000 francs to anyone who could develop an effective method for preserving food and making it safe for consumption by the French military on the battlefield.

Fourteen years later Nicolas Appert, a little known French brewer employed as a confectioner, introduced a method of packing food into bottles, sealing the bottles with corks, then heat treating the filled bottles in boiling water. Appert held to the popular myth of the time that fermentation was the evil that caused all food to spoil. But he also believed that there was a realistic cure for this evil. He theorized that applying heat to a closed container would create a hermetic seal and remove all oxygen from the container, thus preventing "ferment" from becoming active. The system was not perfect, but it worked better than any other process known at the time.

Appert was awarded the prize. He quickly opened the world's first known canning factory and started processing preserved foods for the French military.

His theory was confirmed 50 years later by Louis Pasteur. Pasteur was researching the problem of young wine fermenting to vinegar during aging. He did not give credence



to the popular theory that fermentation resulted from spontaneous generation—life arising from nothing. He discovered that alcohol and vinegar fermentation were caused by the presence of plant-related micro-organisms that were everywhere—in the air, in water, and on all matter. More importantly he discovered there were some forms of these micro-organisms that did not need oxygen from the air to live and regenerate. This explained why wine could spoil in air-tight casks. Both types however, could be destroyed or rendered inactive using a modification of Appert's method.

The birth of mason jars

Peter Durand, an Englishman, and John Landis Mason, an American, further developed Appert's system of hermetic sealing. They both invented containers that were more reliable than the cork-sealed bottle. Durand invented containers made of steel, thinly coated with tin to prevent corrosion. Mason developed and patented a glass jar with a shoulder and a screw-top lid. These metal cans and mason jars have since become the standard for modern food preserving containers.

Until the end of World War II, home preserving was common in the United States, and families frequently traded their pickle, chutney, jam, and jelly recipes with each other. Large families often put up thousands of jars of preserved food to make it through the winter and to the next harvest season. But in the decades following the war, the old methods that reflected the culinary wisdom and creativity of our grandparents and great grandparents took a back seat to a succession of trends that included factory canning, prepackaged foods, and the disappearance of the small garden.

Then in the 1980s some of the old standards started to reappear. Home gardens were flourishing in more than half of the nations households. Road weary, plastic-choked produce was made unacceptable to the consumer by the increase in local farm stands and orchards which offered pick-your-own options. Many small farmers became truck vendors, driving through neighborhoods offering fresh fruits and vegetables picked only hours before being sold.

Home preserving also received new life during this resurgence of American culinary heritage. Seed catalogs began selling a wide selection of canning equipment. We are now in the last decade of the century and the upsurge in home preserving is not going away. This despite the fact that every supermarket, convenience store, many gift shops, and even drugstores offer a wide selection of jams, jellies, pickles, relishes, fruits, vegetables, and so on.

With all this variety within easy reach, and at generally good prices, it wouldn't seem practical to preserve foods at home. Especially when you consider the initial capital investment necessary to purchase pressure canners, boiling water-bath canners, jars, lids and other equipment necessary to ensure safe and effective canning. There is also an investment of time and physical energy. But home canning is coming back, anyway.

The reasons are many, but I think that superior quality and taste top the list. Preserves made with local fruits and vegetables that are processed shortly after being picked off of the bush or unearthed from the soil are far superior to those made with produce picked in some unknown part of the world and treated with unknown substances.

I am going to share with you a few favorite preserving recipes and techniques that were given to me by friends and family. All of these folks are experienced gardeners and view preserving as a creative way to extend the wonderful rewards of a successful growing season.

Follow these recipes using freshly picked produce that is being processed as close to harvest time as possible. The finished product will reward you with culinary delight that cannot be purchased in any store.

Home preservation basics

Let's get started with a review of some home preserving basics. This information will help to make your preserving effort successful and, above all, safe. Fruits and vegetables selected for preserving must be harvested while slightly underripe and free of all signs of decay and visible bumps and bruises. They must also be handled in a way that will eliminate contamination caused by enzymes, yeast, molds, and bacteria. Since these major food spoilers are omnipresent and can't be avoided, they must be destroyed before the preserving process is completed.

How do these food spoilers work? Enzymes are biochemicals contained in the cells of all plants and animals. They are essential for fruits and vegetables to ripen. If the action of enzymes is not stopped, their continued activity will cause food to rot.

Yeasts are plant-related micro-organisms that feed on sugars. This feeding starts fermenting the sugar to alcohol, which is fine for beer and wine, but does no justice to applesauce.

Molds are also plant-related micro-organisms that feed on the natural acid in food. Acidity in food acts to protect food against spoilage. Reduce the natural acid level in any food and decay will soon follow.

Of all the evils that can infect food, bacteria are by far the most dangerous. These seaweed-related micro-organisms are in the air, water, and soil. Most strains can survive temperature extremes that destroy other microbes. The most dangerous of the lot is the bacteria that causes botulism, *clostridium botulinum*. The poisonous toxin secreted by this microbe is so powerful that a teaspoon full is enough to kill hundreds of thousands of people. Botulinus bacteria will also live and reproduce in an oxygen-starved environment, so canned foods provide it with a perfect home. Foods infected with botulinus bacteria often show no signs of contamination.

The best safeguard against bacterial infection taking residence in your preserved food is faithfully maintaining high sanitation standards and following proven safe canning techniques. Taking short cuts will put the health of you and your family at peril.

How to keep the spoilers in check.

Heat is the only force that will stop enzyme activity. Precooking or blanching the food to be canned, then following the boiling-water bath or pressure processing methods will eliminate this problem. Some foods can be packed raw, then processed if proper heat treating procedures are followed. The best way to control yeasts, molds, and bacteria is to deny them a comfortable environment. Good sanitation procedures, consistently followed throughout the preserving process, are your best defense against these terrifying microbes.

Wash all fruits and vegetables with plenty of cold potable water before you begin processing. Wash all work surfaces and utensils with a 16 to 1 chlorine bleach sanitizing solution (1/4 cup of bleach to 4 cups of cold water) and allow them to air dry. The chlorine will dissipate into the air during the drying process without leaving a residue. Good sanitation and effective preserving techniques will eliminate all danger of bacterial infection in your canned foods.

There are two effective methods for processing all foods canned at home: the boiling water bath and pressure processing. The boiling water bath method is used when canning high acid foods, jams, jellies, and fruits doused in sugar syrups. Pressure processing is used to process all low acid foods and starchy foods like corn and potatoes and protein foods like meat and fish. All of the recipes included in this column were designed to use the boiling water bath method. Pressure processing will be the subject of another column.

Essential equipment

Let's talk about the equipment you'll need to preserve food using the boiling water bath canning method. You probably have many of these items in your kitchen already.

- 8-qt stainless steel pot with lid for pre-cooking and blanching foods
- 21-qt. ceramic on steel deep water bath canner designed for processing quart jars. This 10-inch deep canner is necessary to provide the adequate top and bottom clearance for processing pint and quart jars. The jars must be elevated at least 1/2 inch to 1 inch from the bottom of the canner while providing at least 3 inches of space between the tops of the jars and the rim of the canner. This keeps the jars off the bottom of the canner so they don't break during processing, allows a two-inch water cover over the jars during processing, and gives at least one inch of clearance from the water cover to the top of the canner to keep water from splashing all over your stove during the boil.
- A good rack. The only problem with the rack that came with my deep water bath was the poor design of the jar rack. The jar cradles are almost too large to keep quart jars from touching the bottom of the canner and it's not at all usable with pint and half pint jars. Since I don't put up food in quart jars, I set the canner rack aside and purchased round cake racks. I support the cake racks on the inside of the canner with old mason jar screw bands without the sealing lids. This system works well and the 1/2-inch-thick screw bands give plenty of clearance on the bottom to ensure good water circulation during the boiling process.
- 1 case of 8-oz mason jelly jars with screw bands and lids.
- 1 case of pint-sized, wide-mouth mason canning jars with screw bands and lids.
- An accurate kitchen timer with alarm or warning bell.
- 1 pencil-shaped glass food thermometer.
- 1 ladle.
- 1 slotted stainless steel spoon for removing food after pre-cooking.
- 1 wide mouth funnel for filling the jars.
- 1 stainless steel colander for draining foods.
- 1 jar lifter for placing the jars in and removing them from boiling water
- plenty of clean dish towels
- Measuring cups in sizes up to 1 qt. (and including cup fractions)
- An assortment of measuring spoons, from 1/8 tsp. to 1 Tbsp.
- Jelly strainer with jelly bags for making jellies.

- 1 accurate food scale with at least a two-pound capacity.
- 2 narrow-blade heat-resistant spatulas.

Other Equipment:

If you don't own a food processor, a large wooden or plastic cutting board, and a professional set of kitchen knives, now is the time to treat yourself. These items are not essential but they will save you lots of time.

Let's get started

Canning, fermenting, drying, pickling, smoking, salt curing and deep freezing are all preserving arts that require the practitioner to follow a strict set of procedural rules to ensure success. The procedural rules for canning can be very difficult reading, especially if you are new to the craft. In an attempt to avoid a lot of general facts that are not required to successfully prepare the recipes included in this article, I have included enough information with each recipe to successfully prepare that recipe. If you are pleased with the results and want to learn more, I have included a list of suggested reading that covers most preserving methods in detail. But reading about food does not teach you as much as actually working with it.

Old World Apple Chutney

This is a recipe that my sister-in-law, Trudy, brought back from England. The apples she used in her recipe are fresh-picked Washington State Pippins but I've used Granny Smiths, Vermont Northern Spys, and Connecticut grown Romes with good results. Any firm, slightly underripe cooking apple will do as long as it is fresh picked. The flavor of this chutney will be even better if you buy whole ginger and cinnamon and grind them yourself.

Chutney is a high acid condiment and very safe for canning. Because of this, many books will suggest that the boiling water bath is not necessary. That may be so, but I process all of my canned foods by finishing them off with the boiling water bath method or pressure processing.

Ingredients

40 oz cider vinegar
1 1/2 lb brown sugar
1 1/2 tsp kosher salt
1 Tbsp ground ginger
2 tsp ground cinnamon
1 Tbsp pickling spice
6 whole cloves and 1 bay leaf tied in a spice bag
4 lbs fresh picked underripe apples
2 lbs Spanish onions
2 fresh garlic cloves, minced
1 lb golden raisins

Special equipment

8 qt stainless steel sauce pot
Boiling water bath canner
16 pint mason jars with screw bands and sealing lids.
Wide mouth funnel
Thin blade spatula
4-oz ladle or solid stainless steel kitchen spoon
A 9-inch pie plate for catching spills

Method

1. Combine the vinegar, brown sugar, kosher salt, ground ginger, ground cinnamon, pickling spice, and spice bag in an 8-qt. sauce pot. Mix and bring to a slow boil over medium to low heat for 30 minutes.

2. While the sugar syrup is cooking, peel, core and coarsely chop the apples. Peel and coarsely chop the onions, and mince the garlic clove. Uniformity is not necessary; this chutney is meant to be chunky.

3. Combine the apple, onion, and garlic in the cooked syrup and cook the mixture over low heat for 1 1/2 hours, stirring occasionally to prevent scorching.

Packing, processing and storage

1. While the chutney is cooking, carefully wash the jars, screw bands, and lids in hot soapy water and rinse with plenty of hot water. Fill the clean jars with boiling water and cover with a clean towel. Place the screw bands and lids in a bowl and cover them with boiling water. Let them stand this way until you are ready to fill them. Time this process so that the boiling water will not cool below 160º F or remain in the jars for more then 10 minutes.

2. Arrange all necessary utensils so that you will be able to fill, seal, and cap the jars efficiently.

3. Fill the canner to 1/2 of its capacity with water, place the racks on the bottom, and start heating it to a boil. Have an additional kettle of boiling water available to add more boiling water to the canner after the filled jars have been put into place.

4. Fill the jars with hot chutney to 1/2 inch from the top, using the wide mouth funnel to minimize spilling. Then set them, one at a time, on the pie plate. Remove any trapped air from the jars by running the narrow blade of the spatula down the sides of the jar. Carefully wipe the rim of the jar with a clean cloth that has been wet with boiling water to remove any traces of food. Set the sealing lid on the rim of the jar and screw on the band until it is firmly in place. Do not force or over-tighten the band. Put the jar in the canner. The 21-qt. canner will hold 8 pint jars and 12 half pint jars without crowding. As you are placing the jars in the canner, set them so they are not touching each other or the side of the canner.

5. Add enough boiling water to the canner to cover the jars with two inches of water. Do not compromise this step;

proper processing requires at least a two inch covering of rapidly boiling water. Less water may cause the whole procedure to fail. The yeasts, molds, and bacteria would love that.

6. Process the filled jars for 15 minutes in **rapidly** boiling water.

The further above sea level you are, the less heat required to boil water. From sea level up to about 1,000 ft above sea level, water boils at 212º F. At 5,000 ft water boils at only 203º F, and 194º F at 10,000 ft. Heat is essential to kill microbes in food. As you can see, getting the water hot enough for sterilization is more difficult at high altitudes.

To compensate for altitude add at least two minutes of processing time for every 1000 feet above sea level. This is a general rule that works well with high acid foods like jams, jellies, and fruits canned in sugar syrups.

7. When the processing is complete, turn off the heat. Using the jar lifter, carefully remove the jars from the canner and set them on a towel-covered flat surface to cool. It is important not to disturb the jar during the next 24 hours. During this period the jars will cool and the vacuum sealing will occur. With the modern mason jars the vacuum created during the cooling period will pull down the dome in the center of each lid to make the air tight seal. If the seal does not happen, just store the chutney in the refrigerator and eat it within a few days.

Storage

Food preserved in jars must be protected from light and excessive heat. A dark corner of the cellar where the temperature does not exceed 50º F is perfect. If cellar space is limited or non existent, wrap the jars in a sheet of newspaper, pack in a suitable size box, and store in a closet or cabinet that does not get direct sunlight.

The flavor of this chutney will continue to mellow and improve for 6 to 8 weeks—if you can wait that long.

Western blackberry jam

This recipe is a combination of two recipes I received from my sister-in-law Trudy, and John Silveira, the *Backwoods Home Magazine* senior editor. Last summer I sampled a blackberry jam John made from berries he picked across the road from the *BHM* office. Two years ago, while visiting Trudy, who now lives in southern Washington, I tasted a seedless blackberry jam she made with berries she picked in her back yard. (Blackberry bushes are so prevalent on the west coast that some folks consider them a nuisance.) Both of these blackberry delights had the most intense flavor of any berry jam I have ever tasted; so I asked them both to send me the recipes.

The recipes were so similar that I decided to combined them into one recipe with the option of making a seedless or a regular whole pulp jam by slightly modifying the procedure and the amount of berries. Once again, the success of

this recipe depends on the quality of the fruit. The berries must be picked when mature but under ripe, and processed no more then two hours after harvest. This is when blackberries contain a high amount of natural acid and pectin, both of which are necessary to ensure that the jam sets up properly.

Jell testing

This jam is made without commercial pectin, so you will need to test the cooked jam to determine when the jell stage has been reached. When this point is reached depends on the quality and age of the fruit. The more ripe the fruit is, the less natural pectin it will contain and it will have to cook for a longer period than slightly underripe fruit. If everything is as it should be, this berry mixture should reach jell stage in about 15 minutes. There are a few ways of testing jell stage; the following test is simple and works as well as more complicated methods.

With a clean dry spoon, scoop up a small amount of jell liquid and hold it above a saucer. Tilt the spoon so that the jell runs off the side of the bowl of the spoon. If it falls in two separate drops, it is not ready. If the two drops merge, and fall in one sheet, jell stage has been reached. If you have to test again use a clean dry spoon.

Ingredients

- 9 cups mature barely ripe blackberries (13 cups if making seedless jam)
- 4 cups sugar

Special equipment

- 8 qt stainless steel sauce pot
- Boiling water bath canner

1 large medium to fine mesh sieve to strain seeds if desired
5 half pint mason jars with screw bands and lids
wide mouth funnel
4 oz ladle
9 inch pie plate for catching spills
large stainless steel bowl

Method

1. Sort and wash the berries, remove the stems and caps. Layer berries in a large stainless steel bowl with sugar, cover and allow to rest in the refrigerator for at least eight hours.

2. Transfer the berries to the sauce pan and bring to a simmer over medium heat and cook until the berries are soft, about 20 minutes.

3. If you are making seedless jam, strain the berry mixture through the fine sieve.

4. Continue cooking over medium heat until the jell stage is reached.

5. Ladle hot jam into prepared jars, as outlined in the previous recipe and process in the hot water bath canner for 10 minutes.

Storage

Store in the same way as the chutney.

Ruth's old fashioned zucchini pickles

As I set the summer squash plants in the soil, I could hear the little voice inside saying, once again, "What are you going to do with all of this squash?"

Usually, I dismiss this with something like, "This isn't as much as I planted last year."

Well, even though it is less, it is probably still too much. But this year I think I have a partial solution to the problem. The following recipe is a standard sweet pickle recipe that Trudy modified slightly so she could substitute green and yellow summer squash for cucumbers. I was skeptical about the concept until I tasted some that she sent to her father for his birthday. He wasn't thrilled about sharing them with anyone and, if you make a batch, you'll understand why.

For the best results, use only small, firm squash because they have more flavor and less water.

Ingredients

7 lbs zucchini or yellow summer squash
1 large sweet red pepper
4 large white onions
1/3 cup course sea salt or kosher salt
Ice water to cover
2 cups cider vinegar
3 1/2 cups sugar
1 tsp turmeric
1 1/2 tsp celery seed
2 Tbsp mustard seed

Special Equipment

Large stainless steel bowl
8 qt stainless steel sauce pot
8 pint mason jars with screw bands and lids
Large mouth funnel
Narrow blade spatula

Method

1. Wash the squash and pepper in plenty of cold water and drain. Slice the squash on the diagonal into 1/2 inch pieces. Cut the pepper in half, remove the seeds and slice it into pieces that are one inch long by 1/4 inch thick.

2. Peel the onions, cut them in half, and slice them lengthwise into 1/4 inch strips.

3. In a large stainless steel bowl mix the squash, pepper, and onions with the salt. Add just enough ice water to cover the vegetables. Let the vegetables stand for three hours, then drain.

4. In a sauce pan mix together the cider vinegar, sugar, turmeric, celery seed, and mustard seed. Bring this mixture to a boil over medium heat while stirring constantly. Remove it from the heat as soon as it starts to boil.

5. Combine the hot liquid with the drained vegetables in a large sauce pan and bring the mixture to a boil once again. Turn off the heat as soon as the boil starts.

6. With a slotted spoon fill the jars with the hot vegetables to 1/2 inch from the top. Divide the hot pickling brine evenly among the jars without exceeding the 1/2 inch head space. Follow the procedure outlined in the chutney recipe then process the jars in the hot water bath for 10 minutes.

7. Store the pickles in a cool dark spot for 3 to 4 weeks.

If you want to read more, find The New Putting Food By, by Ruth Hertzberg, Beatrice Vaughan, and Janet Greene from the Stephen Greene Press in Brattleboro, Vermont. The ISBN for the hardbound is 0-8289-0468-5 and for the paperback it's 0-8289-0469-3.

Home preserving, in all of its forms, is an ongoing chapter in the gastronomic story of America and it truly reflects the great bounty and many creative cooking styles that make American food worth writing about. Please drop me a line and share your favorite preserving recipe or method. I just purchased a 200 pound capacity commercial smoker and I need some good smoking recipes to share with the world. See you next time. Δ

When angry, count four; when very angry, swear.

Mark Twain
1835-1910

Plan your energy-independent home *before* you begin construction

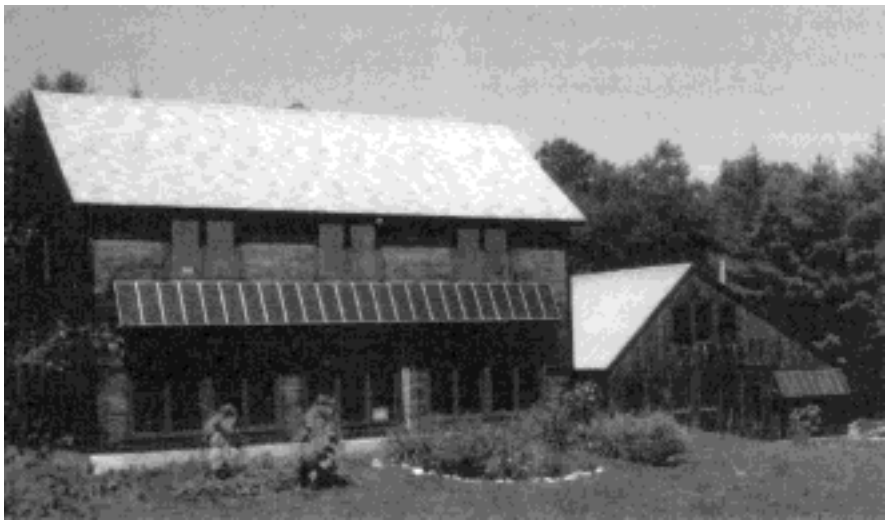
By Paul Jeffrey Fowler

Over the years, as the owner of a successful solar electric business, I spoke with thousands of people about designing and installing a solar electric system. The majority of the customers who were building their homes contacted me after their homes were mostly completed, when many of their designs were irreversible. I always wished I could have helped these people with their choices before they had begun to build.

Obviously, I could have helped them to orient their houses for proper exposure to the sun and to plan for the installations of a solar electric array, system controls, and a battery room. In most cases, they had done fairly well on these aspects from reading solar electric books. I really wish I could have reached them early enough in their planning process so they could have built true alternative energy homes, not just houses with solar electricity installed on them.

In homebuilding, it is difficult to be creative, since a house is built with very standardized methods and materials. However, innovation is necessary in designing an alternative energy home, because it will use electricity much differently than a conventional "on-the-grid" home. In an alternative energy home, the goal should be to build a home such that the people using it will feel that they are enjoying a conventional level of comfort, though their source of electricity is an independent system.

A grid home in our area pays about 10¢ per kilowatt-hour for electricity, while a solar-electric-system owner pays an average of 30¢ per kilowatt-hour. Furthermore, the owner must invest up front in the equipment to produce 10 to 20 years of this



The author's home, with solar electric modules on the house and garage

30¢/kilowatt-hour electricity. My personal goal has been to use only one-third as much electricity as a conventional home of similar size and comfort by designing conservation into my home. In truth, solar electric homes almost never utilize a solar electric system to meet the typical energy demands of a conventional home. Solar electric homes are successful because of *conservation* of electricity.

Before you build your dream independent home, examine those loads that would be energy hogs if they were powered by electricity. These are normally heating, hot water, and cooking. You should try to power any heating load by another energy source. In the Northeast, even most grid homes choose to purchase less-expensive LP gas to power the kitchen stove and the hot water heater, and heat the house with wood, oil, or gas in preference to using electric heat.

Heating and cooking

Plan to buy a pilot-model propane stove. Standard propane stoves now come with an electric ignition feature that creates some problems when it's used with an inverter's load demand function. (An inverter is the part of a solar electric system that transforms the direct current—DC—from the battery bank into the alternating current—AC—used in the home.)

Solar electric homes are successful because of conservation of electricity.

Solar hot water, wood-heated hot water, or a summer/winter hybrid of the two provide a renewable-energy hot water system. Conventional LP hot water heaters work well, but I prefer our more efficient Aquastar tankless model. Using LP is certainly not energy independence, since you are married to the gas company. However, it is more commonly used than wood for cooking or heating water. A home often uses only a 100-pound tank of propane per month, so those living far into the outback can transport the LP themselves.

Heating your solar electric home with a conventional oil or gas furnace is a problem: furnaces use a lot of electricity to run circulating pumps in hot-water systems or circulating fans in hot-air systems. Your alternative energy home should be designed to be heated by wood stoves, LP space heaters, passive solar energy, or any combination thereof, because these methods of heating require no electricity.

Solar heating

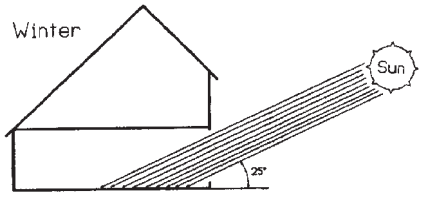
If you're planning to power your home with a solar electric system, you most likely have good solar exposure at your house site. I recommend incorporating some passive solar heating into your house design. This will require both south-facing windows and a heat sink (such as stone walls or concrete slab floors) that can absorb the heat of the winter sunlight. This will prevent the house from overheating during the day, while storing some heat for the night. Wood heat is a good partner for the passive solar heat.

...leafless branches in winter will reduce the solar energy by 35%

Many owners of independent homes find they are house-bound during the winter, because they can't leave their wood fires unattended for a weekend without the pipes freezing. Because you will not be using a furnace, you can plan for an LP space heater for backup heat.

Insulation

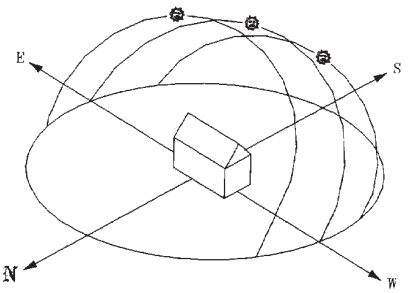
It is also possible to design a simple and affordable passive solar home that requires no furnace or backup LP heater. Our own 1800 square-foot, passive-solar, well-insulated home uses two cords of wood per year and will not drop below freezing in the worst sub-zero weather while we are away. If you do plan to use passive solar heat, you will need to insulate your home more heavily than is standard for your area. In my town, homes are commonly insulated with six inches of fiberglass, but I used eight inches. You should also insulate the outside walls of the basement, or the perimeter of the floor slab, with two inches of foam insulation. One benefit of extra insulation is that it will lower the number of cords of wood you will have to cut each year for the rest of your life.



Design your house for passive solar heating.

Cooling

In hotter climates, you will have to plan ways to keep your home cool without using standard electric air conditioning. Ceiling fans can be powered by super-efficient low-voltage DC motors that use a tenth of the electricity of AC fans. There are evaporative air conditioners or "swamp coolers" that use only a small amount of electricity for small pumps. The house site can be landscaped, and overhangs can be designed, to shade the house from the sun in the hot months. Once again, the home must be well-insulated. Brave people can abandon a conventional home in favor of an earth-bermed, or underground, home that utilizes the earth to cool it in the summer and insulate it from the cold in the winter.

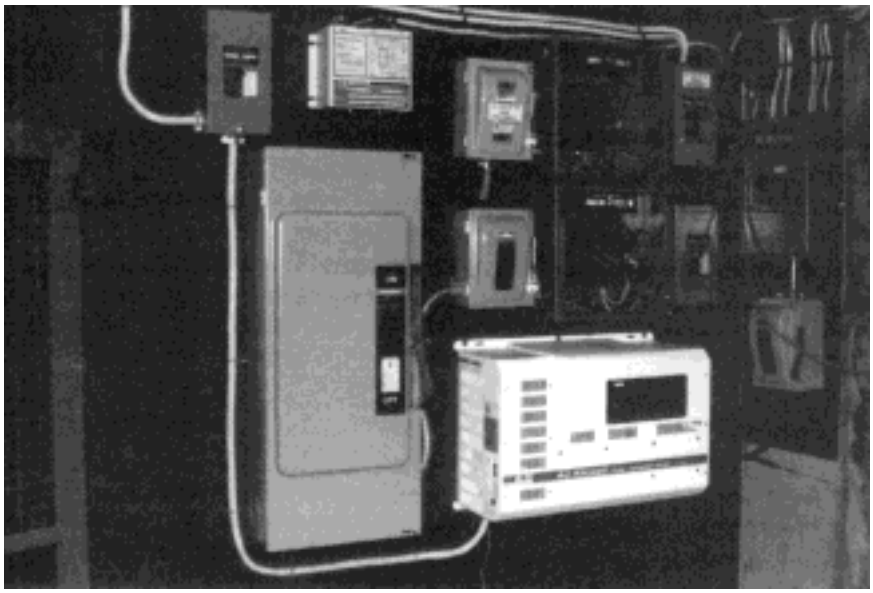


In an unobstructed site, you get maximum sun due south all year.

Water

An independent home needs its own water supply, and water-pumping can be a heavy electrical load to reckon with. A minority of folks can supply water using a spring on a hillside above the home that flows by gravity. Most people will have to drill a well. In dry areas of the country with deep aquifers, expensive deep wells require pump motors that are too large to be powered by an inverter in a solar electric system. In this case, you need to get a specialty jack pump powered by a low-voltage DC motor and an appropriately large storage tank. Look for help designing this system before you start building the house.

For homes with drilled or dug wells, there are choices for well pumps that work better with a solar electric system. If you can have a dug well close to the house, and the surface level of the water is less than 18 feet below the pump in the basement, you can utilize a centrifugal pump. The standard AC centrifugal pump (or its relative, a jet pump) is extremely inefficient. A better option is an efficient low-voltage DC pump that is powered from the battery bank. If you have a deeper well with a static water level that is lower than 18 feet, you can most likely use a 1/2 or 1/3 HP (horsepower) conventional deep-well pump. These pumps sit near the bottom of the well and push the water up, which is more efficient than pulling it up with a centrifugal pump. Deep-well pumps are normally 240VAC (240-volt alternating current), but they are also available in 120VAC, which is compatible with the 120VAC inverter in a solar electric system.



The inverter and controls, mounted on the basement side of the battery room wall

Getting enough sun

A solar electric home must have a daily minimum of six hours of solar exposure. Before you start building the house, you need to plot the daily path of the sun at your house site for the four seasons of the year. Shading trees must be removed. Even shading by leafless branches in the winter will reduce the solar energy by 35%. Most commonly, a solar house is oriented with one side facing due south (not magnetic south), with the ridge pole in an east-west line. The south wall can utilize extra windows for passive solar heating, and the roof can support the mounting structure for the solar electric modules.

Sometimes you can increase the total daily solar gain by shifting the orientation away from due south. For example, if there is a lack of solar exposure in the afternoon (maybe the sun passes over a ridge at 2 PM) and extra exposure earlier in the morning (an easterly valley), the orientation can be shifted 20° to the east to maximize your solar energy per day. Correspondingly, the house could be shifted to the west, if the ridge were to the east and the valley to the west.

Placement of modules, batteries, and controls

Solar electric modules may be installed on ground, wall, or roof-mounted structures. For a ground mount, you will need to plan for a ditch and a hole in the foundation wall for the underground cable from the module array to the battery bank. For a roof mount, you will need reinforced areas under the roof boards and between the rafters, where you will bolt the frame. You will also need a conduit, or interior wall space, to run the wires from the roof to the battery bank. If possible, the wires should be accessible after the house is finished to permit repairs and system upgrades. Solar electric module arrays send low-voltage DC electricity (usually at 12 or 24 volts) to the batteries. These wire runs should be kept as short as possible to reduce the need for thicker, more expensive cables.

The battery bank should not be inside the living area of the house. Lead-acid storage batteries smell when they are being charged hard, and they produce flammable hydrogen gas. Also, the batteries should not be installed in a cold environment, because the cold reduces their electrical storage capacity. A battery bank is ideally installed in its own ventilated room in a basement. Ventilation to the outdoors is necessary, so plan to leave an appropriate hole when you pour the foundation.

The system controls and the inverter should be as close to the batteries as possible without actually being in the battery room. Inverters typically draw 100-400 amps from the low-voltage battery bank, requiring large cables, preferably no more than five feet long. The controls will arc sparks when DC circuits are opened and closed, which could ignite the hydrogen gas produced by the batteries. Usually the inverter and controls are mounted in a four-by-eight-foot area on the basement side of the wall that separates the basement from the battery area.

If you plan to have a small solar electric system with 12V appliances and no inverter, you may want to locate the battery bank centrally to reduce the length of the circuits that will feed 12V electricity to the house, thus avoiding long runs that require thick, expensive cables.

A standard 15-20 cubic foot 120VAC refrigerator uses more electricity per day than your whole solar electric system could produce.

Most solar electric systems today utilize an inverter to change the low-voltage DC electricity from the battery bank to standard 120VAC electricity. Now that these inverters have become reliable and efficient, most people don't use DC appliances in their homes. Therefore, it is necessary to wire your home with the standard number of AC outlets, fixtures, switches, circuits, and circuit breakers. You may feel you do not need them now, but remember that it's easier to

run wires before the walls are closed in.

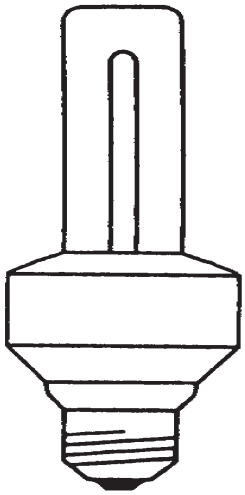
Lighting

Lighting is a large load for your solar electric system. Furthermore, you will need more hours of electric lighting during the winter months when the days are short, which is also the time of year when we receive less solar energy to produce electricity. You can reduce your electrical consumption by choosing lighting fixtures that give you more light and supply that light where it can be best used. Avoid recessed fixtures that lose much of a bulb's light production to the black inside. Instead, seek out fixtures with globes or lenses that project the most light. Compact fluorescent bulbs are your most likely source of efficient and pleasing light. Unfortunately, these bulbs vary in size and shape. Try to select fixtures that can accommodate them. Some lights need to provide general lighting, while other lights need to be focused for detail work or reading. Choose your lights for where and how they will be used.

The best and most pleasing light for all activities is natural light. You can reduce the amount of electricity needed for lighting by matching window placement with areas that need light. For example, match your kitchen work areas to your kitchen windows so that electric lights are only needed at night. We rarely turn on a light in our home during daylight hours, because natural light does the job. Natural light is enhanced by white ceilings and walls to keep the light from being absorbed and lost.

Generators

Many solar electric homes use a generator to supplement their electrical needs in low-sun periods. If the generator is used often, it will need its own little shed or place in the garage, with an exhaust system to the outdoors, hopefully out of noise range for the house and the neighbors. You will need to leave another hole in the foundation and a ditch for the underground line or conduit from the generator to the basement. If you have an LP powered unit, you will also have to plan for an underground LP gas line from the LP tank to the generator.



A compact fluorescent bulb

Cold storage

A standard 15-20 cubic-foot 120VAC refrigerator uses more electricity per day than your whole solar electric system could produce. Standard refrigerators are among America's most inefficient appliances and are not acceptable for an independent energy home. In sunny climates, you may choose a super-efficient low-voltage DC refrigerator. You will need to plan for an extra $1,000-1,500 investment in your solar electric array to power it. In climates like the Northeast, where I live, it is difficult to run even a super-efficient DC refrigerator, because it is a constant load even when the sun does not shine for several weeks straight. Most independent homes use an LP refrigerator that consumes about seven gallons of propane per month.

There are low-voltage DC freezers, but they consume about twice as much electricity as a DC refrigerator to maintain the lower temperature and to cool the room-temperature foods that are added to them. LP freezers are small and extremely expensive. Most solar electric homes have no freezer. To compensate for this, I recommend planning a root cellar or cold storage room into your house design if you live in an area with cold winters.

The simplest cold storage room consists of a small room, well insulated from the basement and the warm ceiling of the house above, located in the north corner of the basement. In winter, the cold exterior walls of the foundation keep the room cool. Additionally, you may add one four-inch ventilation pipe that runs from just above ground, outside the basement, into the cold-storage room and down to its floor, and a second four-inch pipe from the ceiling of the cold-storage room, to the outside, and up the wall of the house six or eight feet. When the outside temperature is colder than the cold-storage room, cold outside air circulates into the space and warmer air rises out of the space.

A garden works well with the cold-storage room, because it supplies fresh vegetables in the summer, when the cold storage area is not cold, thus further reducing the need for a freezer and a large refrigerator.

To plan and design an independent home powered by solar electricity, you will need a lot more information than the few pages of this article. I hope I have started you thinking about the many facets of design that could help you plan and build an independent home—a home that uses far less power than your old "grid home," and at the same time provides you with a more comfortable existence, and a better and more sustainable life.

(Paul Jeffrey Fowler is the author of The Evolution of an Independent Home: The Story of a Solar Electric Pioneer, 1995, ISBN 0-9645111-7-7, distributed by Chelsea Green, available from *Backwoods Home Magazine*. He has written several successful how-to books on solar electricity.) Δ